

SITE AND SITUATION DETERMINANTS  
OF HOTEL ROOM RATES

by

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A Thesis Submitted to the Faculty of the  
DEPARTMENT OF GEOGRAPHY AND REGIONAL DEVELOPMENT

In Partial Fulfillment of the Requirements  
For the Degree of

MASTER OF ARTS  
WITH A MAJOR IN GEOGRAPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2000

DRUG QUALITY INSPECTED 4

20000627 142

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE 6.Jun.00		3. REPORT TYPE AND DATES COVERED THESIS
4. TITLE AND SUBTITLE SITE AND SITUATION DETERMINANTS OF HOTEL ROOM RATES			5. FUNDING NUMBERS	
6. AUTHOR(S) CAPT WHITE PATRICK J				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) UNIVERSITY OF ARIZONA			8. PERFORMING ORGANIZATION REPORT NUMBER  FY00-202	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) THE DEPARTMENT OF THE AIR FORCE AFIT/CIA, BLDG 125 2950 P STREET WPAFB OH 45433			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION AVAILABILITY STATEMENT Unlimited distribution In Accordance With AFI 35-205/AFIT Sup 1			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)				
14. SUBJECT TERMS			15. NUMBER OF PAGES 108	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT	

DTIC QUALITY INSPECTED 4

Standard Form 298 (Rev. 2-89) (EG)  
Prescribed by ANSI Std. Z39.18  
Designed using Perform Pro, WHS/DIOR, Oct 94

## ACKNOWLEDGEMENTS

I wish to extend my sincere appreciation to Dr. Gordon Mulligan, my committee chair and advisor, for his suggestion of this topic, as well as continuous guidance and assistance during my graduate studies. I would like to thank committee members, Dr. Brigitte Waldorf and Dr. David Plane, for their insightful suggestions and valuable comments. I appreciate the countless hours Peter Johnson at the Center for Applied Spatial Analysis (CASA) spent assisting me with Geographic Information Systems. I gratefully acknowledge my fiancé, Wendie Fisher, for her patience, careful editing, and wise suggestions. The above individuals significantly contributed to the completion of this thesis.

Finally, special thanks to the Air Force Institute of Technology and the United States Air Force Academy for providing me with the opportunity and funding to attend graduate school at The University of Arizona.

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## ABSTRACT

This thesis analyzes the variation of hotel room rates at two different geographic scales. At the regional scale, 1998 data from nearly 600 hotels in Arizona, Colorado, New Mexico, and Utah are examined. At the local scale, data for 98 hotels in Tucson, Arizona are analyzed. This thesis argues that both non-spatial and spatial attributes influence the observed price variation in hotel rooms. This issue can be examined in the context of site and situation, traditional geographic concepts that refer to characteristics at a specific location and characteristics relative to that specific location, respectively. Hedonic price functions are used to estimate implicit prices for hotel site and situation attributes. In general, both sets of findings demonstrate that the heterogeneity of hotel room rates is best explained by a combination of nonspatial and spatial variables. This research reveals that site and situation attributes are systematically reflected in hotel room rates.

## CHAPTER 1

### INTRODUCTION

#### 1.1 Research Context

Variations in hotel room rates among different hotels are phenomena that confront all travelers who require temporary lodging. The variations may be attributable to factors such as hotel type, quality of service, amenities offered, room supply and demand, and time of year. However, it is argued that the spatial distribution of hotels plays a significant role in the variation of room rates. The observed heterogeneity of hotel room rates is clearly evident across space; whether “shopping around” for a hotel room or after a cursory examination of hotel directories, the influence of location clearly emerges. Ultimately, rates vary from hotel to hotel, location to location. For example, published room rates in hotel directories show similar hotels charge dissimilar rates in different locations. It is therefore appropriate to uncover the inherent geographic dimensions of hotel room rates. Interestingly, the three most important attributes in the lodging industry are widely considered to be location, location, and location. Surprisingly, however, few empirical studies focus on location and room pricing.

Several methodologies exist for establishing room rates. In the end, the hotel firm’s objective is to fill beds. Consequently, industry analysts lack consensus regarding the most appropriate strategy for establishing room rates. While the most common method is perhaps yield-management, the existing pricing strategies fail to explicitly account for location. Thus, location’s impact on room rates is often ignored. In this

thesis, it is argued that room rates have an inherent geographic dimension that is largely unaccounted for in the literature. Moreover, the effect of spatial attributes on room rates is not explicitly known by hotel managers. It is therefore pertinent to systematically investigate the spatial variation of hotel room rates. Furthermore, the observed spatial variation leads us to consider which spatial factors cause the price heterogeneity.

This thesis examines the geography of hotel room rates at two geographic scales. It is argued that both nonspatial and spatial sets of attributes influence the observed price variation. This issue is examined in the context of site and situation. Site and situation are traditional geographic concepts that refer to characteristics at a specific location and characteristics relative to a specific location, respectively. Addressing the role of location in a site and situation framework will help reveal the geography of hotel room rates. Site and situation are appropriate because advertising and marketing efforts implicitly refer to site and situation to attract consumers. In an attempt to gain customer patronage, hotel directories, brochures, and advertisements explicitly highlight site attributes such as hotel amenities and situation attributes such as distance to nearby points of interest.

The purpose of this thesis is to systematically examine the spatial variation of hotel room rates. The investigation of price variation is accomplished with hedonic analysis. Specifically, hedonic analysis is employed to uncover the implicit prices of site and situation attributes for hotels at both the regional and local scale. The results are shown to reflect the relative importance of site and situation variables in determining room rates.

## 1.2 Definition of Key Terms

For the purposes of this study it is helpful to provide operational definitions of the key terms hotel, site, and situation. A variety of names exist for accommodations in the lodging industry. Often, lodging properties are classified according to rate structure, location, type of guest, and ownership (Lundberg, Krishnamoorthy, and Stavenga, 1995; Gee, Makens, Choy, 1989; Law, 1993). The lodging industry is comprised of firms classified under Standard Industrial Classification Code 70. According to the U.S. Census, hotels and motels are defined as “commercial establishments, known to the public as hotels, motor hotels, motels, or tourist courts, primarily engaged in providing lodging, or lodging and meals.” For brevity purposes, the term “hotel” will be understood to encompass the Census definition of hotels and motels. Although this definition includes bed-and-breakfast operations and resort hotels, the sample of lodging establishments in this study ranges from small, independent motels to chain budget properties, as well as traditional hotels with food and beverage operations.

Site is defined as structural characteristics of the hotel and the hotel property itself. Site characteristics include hotel amenities and the lot on which it is located. The assessed land value of the hotel property is one example of a site variable. Conversely, situation is defined as the neighborhood and relative locational characteristics of the hotel. Situation variables include characteristics of the surrounding area and the location of the hotel within a rural or urban area. Various socioeconomic factors are examples of situation variables.

### **1.3 Research Questions**

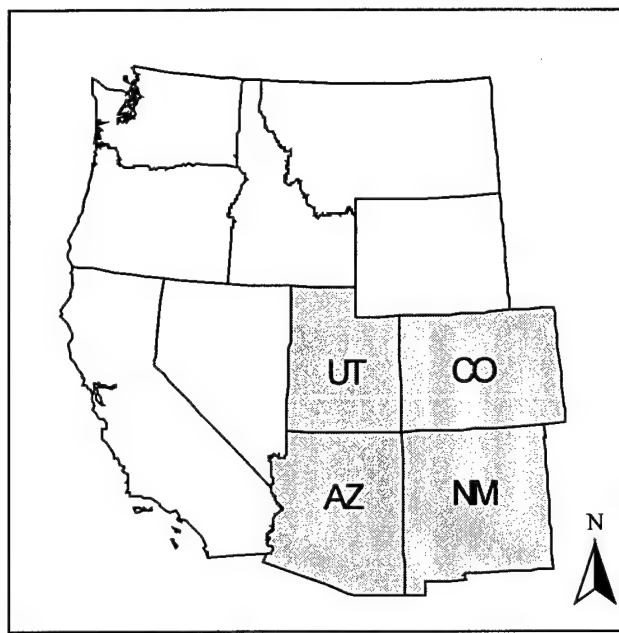
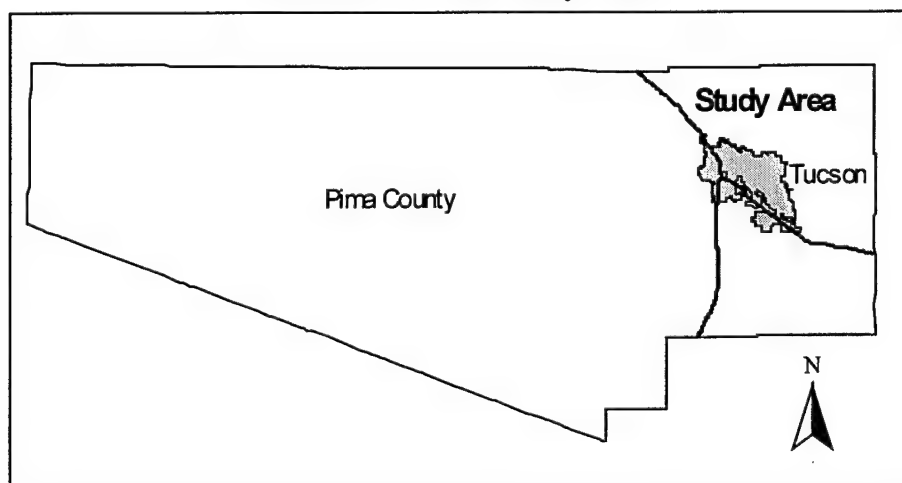
Hedonic analysis will be employed to answer several key questions that are adapted from Burt and Barber's (1996) summary of urban housing price research. First, what major explanatory variables account for the observed variations in individual hotel room rates? Second, what are the key spatial variables at work? Third, what is the relative importance of these spatial or situational variables vis-à-vis other factors? That is, are situation variables more or less important than (site) characteristics of the hotel itself? Fourth, how do these results compare at different geographic scales?

### **1.4 Study Area**

This research examines the spatial variation of hotel room rates at two geographic scales. At the regional scale, a sample of hotels from the Four-Corner states of Arizona, Colorado, New Mexico, and Utah are examined. At the local scale, a sample of hotels in Tucson, Arizona is examined. The study areas are presented in Figures 1.1 and 1.2. The two-scale approach permits (through alternative model specifications) the inclusion of different hypothesized variables that influence room rates.

### **1.5 Significance**

This research is significant from several different perspectives. First, few empirical studies address the geographic dimension of room rates. Second, this research will provide hotel operators with information that can be used in several ways. Third, hotels are significant contributors to local, regional, and national economies. For these three reasons it is pertinent to examine the factors that cause price variation across space.

**FIGURE 1.1. Regional Study Area****FIGURE 1.2. Local Study Area**

Empirical research on the variation of hotel room rates is scarce. Furthermore, geographic research centering on hotel room pricing is even more limited. Studying room rate variations across space is similar to housing price research. Housing price studies receive substantial attention by geographers and economists. Although the ramifications of purchasing a house outweigh those of purchasing a hotel room, many theoretical and methodological insights can be gleaned from housing research. Despite the similarity, a review of the literature reveals that the geographic dimensions of room rates have largely been ignored. A few notable exceptions exist and are highlighted in Chapter 2.

The results of this research can provide useful information to lodging decision makers. First, these findings can help industry leaders better understand the impact of a hotel's location on its room rates as well as determine how subsequent site and situation changes affect rates. As Carvell and Herrin (1990) note, the implicit prices "provide hotel decision makers with information previously unknown to them, namely estimates of the prices of each individual attribute contained in their hotel. This information can be useful when deciding how to adjust room rates when attributes are either added to or eliminated from a hotel."

Second, an understanding of how site and situation characteristics affect room rates can assist in understanding the impact of opening a new hotel in the same market area. For example, if situation characteristics emerge as more determinant of room rates, developers can better gauge the factors involved in site selection and establishing room rates. According to Coy (1998) of the International Society of Hospitality Consultants

(ISHC), location is the most important factor in analyzing the impact of additional motels in a given market area. For example, room rates can be adjusted by geographic area (where demand is greatest). The results of this thesis will provide explicit price estimates associated with site and situation attributes. As such, these findings can potentially complement marketing research on customer choices.

Third, the results can complement research that focuses on consumer willingness to pay for lodging. These findings can provide decision makers with prices of amenities and price estimates that can then be used to estimate attribute demands. Thus, if research shows that consumers do not take advantage of complimentary breakfasts and hedonic analysis suggests that breakfast costs consumers an extra \$6.00, decision makers may choose to eliminate complimentary breakfasts.

It is surprising that studies such as this thesis have not been undertaken in light of the lodging industry's impact on local and regional economies. Hotels are significant for a variety of reasons. Economically, hotels and indeed the tourism industry positively influence the economy at all levels. A substantial amount of revenue is generated by the lodging industry which contributes significantly to a region's economic base. According to the 1992 Economic Census, hotels and motels (Standard Industrial Classification – SIC – 7011) accounted for nearly six percent of the entire service industry's revenue. The Four-Corner states' hotels and motels (taxable firms) had receipts totaling \$3.4 billion in 1992 (five percent of the national share). They also employed 90,789 people (six percent of the national share). Nationally, the American Hotel and Motel Association (AHMA)

reports that the lodging industry had \$93.1 billion in sales, paid \$20.2 billion in wages, and employed 1.16 million people (full- and part-time) in 1998.

The lodging industry, comprised of both business and pleasure travelers, is one dimension of the overall travel and tourism industry. Economically, the travel and tourism industry is one of the most significant industries in the U.S. According to the AHMA, travel and tourism ranks as the first-, second-, or third-largest employer in 32 states and nationally, is the third largest retail industry. In 1998, tourism generated \$495.1 billion in sales and paid \$77.1 billion in federal, state, and local taxes.

The impact of travel spending is of interest to many local, regional, and national groups, such as the U.S. Travel Data Center which investigates state economic impacts. Their report "1994 Impact of Travel Spending on State Economies" includes analysis of travel spending's multiplier effect. In 1994, domestic travelers spent \$340 billion, which generated a total output of \$824.5 billion in expenditures. The ratio of total expenditures output to initial spending is 2.4, which is termed the multiplier. Multiplier effects are essentially ripple effects created by an economic impact, i.e., staying in a hotel. First, an initial or exogenous impact occurs (e.g. travelers' expenditures). Secondary impacts occur as retail/service industries purchase goods and services from local suppliers in the region. The point to stress here is that the greater the concentration of lodging facilities, the greater potential there is for increased multiplier effects. This assumes, of course, that the lodging market is economically viable or productive. A 1997 *Better Homes and Gardens* survey revealed more families vacationed in 1997 than ever before. Approximately 104.2 million U.S. adults traveled with household members 100 miles or

more from home ([www.tia.org/press](http://www.tia.org/press), 29 March 99). Hotels serve as a principal form of expenditure for travelers. Table 1.1 identifies components of tourist expenditure in the U.S. in 1998. Note that accommodations account for 39% of all spending. Finally, hotels are significant because they play a vital role (in metropolitan areas) in attempts to revive central business districts (Milne and Pohlmann, 1998).

**TABLE 1.1 - Spending by U.S. tourists  
who stay in hotels, 1998**

Percentage of expenditure	
Accommodation	39.4
Food	25.8
Shopping	15.2
Entertainment	13.6
Miscellaneous	5.9

Source: D.K. Shifflet & Associates

Examining hotel room rates is important because the majority of hotel income is derived from room rental. Table 1.2 shows the 1982 components of hotel income: room rental accounts for approximately 60%. Additionally, price-sensitive consumers are affected by rate increases and decreases. Understanding what factors affect room rates can be linked with the understanding of what consumers want. Thus, operators can better set prices to ensure financial success.

**TABLE 1.2 - U.S. hotel income, 1982**

Percentage of revenue	
Room rental	60.5
Food sales	23.5
Beverage sales	8.9
Other	7.1

Source: Pannell Kerr Forster, quoted in Law (1993).

Understanding the geography of hotel room rates is important for a few different reasons. First, such a study adds to the limited geographic literature on room rates. Second, this research will enable hotel operators to better understand the impact of location on hotel room rates. Finally, hotels significantly impact the economy and thus deserve our attention. Given the significance of these factors, it is appropriate to consider how site and situation determinants affect hotel room rates.

### **1.6 Thesis Overview**

This research begins with a review of the literature in Chapter 2. Three themes are addressed to help better understand the geography of hotel room rates: lodging as a component of the tourism industry, the relationship between location and lodging, and room pricing. It is found that the lodging industry, which is a significant component of the tourism industry, examines location but not in relation to room rates.

The data are introduced in Chapter 3. The regional data consist of hotel information from six hotel chain national directories for the 1998 time period. The study area includes approximately 584 hotels from the six chains that are located in the four-corner states of Arizona, Colorado, New Mexico, and Utah. The local data consist of hotel information from 98 hotels in Tucson, Arizona.

In Chapter 4, hedonic analysis is employed to determine implicit prices of each site and situation attribute. Hedonic models are introduced to account for the observed variation in individual hotel room rates. Alternative models for each study are compared using F-tests.

The empirical findings are discussed in Chapter 5. The original research agenda singularly focused on the regional scale. In the regional study, it was found that seasonal room rates behave similarly in relation to site and situation variables. In general, the spatial heterogeneity of room rates is best explained by a combination of nonspatial and spatial variables. Thus, location influences room rates. Although the models and the majority of the variables are statistically significant, the comprehensive site and situation model still only explains 61% of the variation in hotel room rates.

However, the regional results were not satisfactory and it was hypothesized that other variables could help improve the outcome. As a result, the analysis was expanded to include a local scale study. Adjusting the scale permitted the inclusion of variables that could not be readily obtained in the regional study. As expected, specific results differ for the regional and local studies because alternatively specified models were employed. In the local study, the comprehensive site and situation model explains 86% of the variation in hotel room rates. Although the results of the local study are more convincing, both studies suggest that the variation of hotel room rates is best explained by a combination of nonspatial and spatial factors. The results of the regional and local models yield implicit prices of hotel site and situation attributes. Furthermore, the analysis indicates that both time series (albeit relatively short) and one-point-in-time price variations are influenced by hotel location. Overall, these results demonstrate that hotel room rate is a function of site and situation.

Chapter 6 draws conclusions from the findings and suggests possible avenues to continue with this scope of inquiry.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

Researchers studying the lodging industry have devoted little attention to the role of geography. While it is widely recognized that location is important to hotel success, nearly all researchers fail to empirically examine the role of location in the industry. However, some general themes emerge from examining prior lodging research. First, lodging is a significant component of the tourism industry. Second, location is an important consideration in the lodging industry and the lodging literature examines location in a variety of ways. Hotel room pricing is the final theme considered. Drawing from the housing price literature, a methodology is revealed that can be applied to room pricing. In all three themes, a lack of geographic emphasis is evident. Each of these topics is examined systematically in an effort to better understand the spatial variation of hotel room rates.

#### **2.2 Lodging as a Component of the Tourism Industry**

##### **2.2.1. Introduction**

The lodging industry is a significant component of the tourism industry. A few basic concepts in lodging will be discussed while highlighting dominant areas of lodging research. Finally, geography's role in lodging research will be noted. When studying the lodging research, the literature on its parent industry of tourism is often encountered. Thus, to conduct lodging research, we first need to understand lodging's niche in the

tourism industry. The tourism industry is of interest to many disciplines due in part to the various impacts it has on society. In particular, geographers study the spatial structure of tourism and its impact on the economy, environment, and culture at different scales. However, it will be argued that a lack of geographic research is devoted to the tourism industry and even less attention devoted to the lodging industry.

Selecting definitions of tourism and travel can be problematic. These simple terms lack definitional consensus in the literature (Lundberg, Krishnamoorthy, and Stavenga, 1995; Smith, 1998; Gee, Makens, Choy, 1989; Law, 1993). Lundberg, Krishnamoorthy, and Stavenga (1995) broadly define tourism as “an activity in which people are engaged in travel away from home primarily for business or pleasure.” The U.S. Census Bureau defines a trip as “each time a person goes to a place at least 100 miles away from home and returns.” These two definitions will serve the purposes of this thesis. Additionally, the tourism industry includes the hospitality industry and the travel industry (Law, 1993).

### **2.2.2 Tourism/Travel Impacts**

#### **2.2.2.1. *Economic***

Lodging is a key economic sector within the multifaceted tourism industry. The tourism industry has many influences on society. Geographers, and indeed other practitioners, study impacts on the economy, environment, and culture. Thus, as noted by Ioannides and Debbage (1998) and Britton (1979), travel and tourism research can be approached from a number of subdisciplines within geography. However, it is the industry's economic impact that is relevant for this thesis. Tourism economics

concentrates on the amount of travel and its direct, indirect, and induced economic impacts that occur before, during, and after a trip (Lundberg, Krishnamoorthy, and Stavenga, 1995). The economic footprint of the travel industry can be examined at a number of different geographic scales. The national, regional, and local influence of tourism is of particular interest to economic geographers as well as public and private entities.

#### *2.2.2.2. Rise of tourism industry's importance*

The relevance of tourism as an industry and its role in economic geography is the subject of much debate and is appropriately summarized in Debbage and Daniels (1998) and Smith (1998). However, the intent of this thesis is not to inventory the totality of the arguments for or against. Rather, it is beneficial to highlight the rise of tourism in the economic landscape since tourism's role compares to a production and consumption system and it comprises part of the space-economy. Additionally, Beauregard (1998) argues that three factors have established tourism as a component of economic development agendas. First, changes in lifestyles and tastes over the last 30 years have expanded the demand for and the supply of tourist activities. Second, as a result of urban restructuring, city governments increasingly turn to the tourism sector to provide new revenue sources. Finally, the political alliances offered by tourist interests made tourism economically attractive and provided access to public decision-making. Lundberg, Krishnamoorthy, and Stavenga (1995) examine tourism forecasting, spending, and the costs and benefits for travel suppliers and various levels of government. It appears that

the tourism industry is significant and an economic sector that is worthy of geographers' attention.

### **2.2.3. Geographic Research**

#### *2.2.3.1. Geography/location's importance to the tourism industry*

Geographic factors such as location and scale are important considerations for the tourism industry. Mitchell (1986) argues that tourism planners need an understanding of spatial concepts to create successful tourism plans. Pearce (1995) suggests tourism in the city is a result of demand imparted by other direct and indirect city functions. Thus, direct and indirect city functions can be regarded in a "situation" context. Economic changes in the central business district and modes of transportation, for example, have impacted the location of motels and tourism (Pearce, 1995; Jakle, Sculle, and Rogers, 1996). Pearce characterizes tourism as having varying degrees of concentration. Each degree of spatial concentration is a function of the level of development for specific geographic scales. Pearce also notes that the spatial structure of hotels is the most widely used measure of spatial variations in the tourism industry.

#### *2.2.3.2. Lack of geographic research*

Despite tourism's geographical dimensions and the influence it has on the economy, researchers, including geographers, give it relatively little attention. This lack of attention is attributable to several causes (Law, 1993; Townsend, 1991; Ioannides and Debbage, 1998). First, it is possible that traditional export base theory has been only focused on manufacturing as the prime economic sector. Second, tourism's employment structure does not fall within one Standard Industrial Classification heading, thus,

detailed research is required to estimate its importance (Law, 1993; Townsend, 1991). However, researchers who do study tourism and travel find a multitude of avenues in which to direct their attention.

Despite the lack of geographic interest that exists in tourism research, geographers who investigate the industry help broaden our understanding. Pearce (1995) synthesizes the geographic dimensions in tourism by emphasizing the concentration, spatial interaction, and questions of scale that emerge in the tourism phenomenon. The spatial dimensions of tourism are often studied in the context of origin and destination flows. Pearce suggests, however, that the majority of geographic research primarily concerns itself with the destination. Ioannides and Debbage (1998) summarize tourism's importance in the geography of economic activity. Mitchell (1986) highlights previous applied tourism research efforts by geographers by noting four recurring themes in the literature contribute to tourism planning: data, relationships, regions, and spatial characteristics. Although a lack of geographic emphasis exists in the tourism literature, some geographer's recognize tourism's significance and help contribute to our understanding of the industry.

#### **2.2.4. Lodging Industry**

The lodging industry is a significant component of the tourism industry. Pearce (1995) suggests that hotels are "the most visible and pure manifestation of tourism in the city." Furthermore, lodging is an essential element in a city's attempt to become a successful tourist center as well as to stimulate economic development (Law, 1993). The following discussion will first focus on lodging's portion of the traveler's budget. The

discussion will proceed by highlighting the various types of lodging establishments and customers. Common themes of lodging research will then be reviewed.

Accommodations are the largest portion of traveler's budget and therefore have the most economic impact. D.K. Shifflet and Associates reports that in 1998 accommodations accounted for approximately 39% of total expenditure by U.S. visitors who stayed in U.S. hotels and motels ([www.amha.com](http://www.amha.com)). According to the American Motel and Hotel Association (AMHA), the lodging industry employed approximately 1.16 million people (full- and part-time) in 1998. The AMHA reports that 24% of customers travel for leisure purposes, 30% are for business purposes and 25% to attend conferences.

Accommodations are typically grouped into several categories reflecting rate structure, location, type of guest, and ownership (Lundberg, Krishnamoorthy, and Stavenga, 1995; Gee, Makens, Choy, 1989; Law, 1993). Smith Travel Research (STR), a leading consultant in the lodging industry, categorizes all lodging chains into one of five segments based upon actual or estimated average daily room rates (Ross, 1997):

- Luxury: top 15 percent of room rates
- Upscale: next 15 percent of room rates
- Mid-Price: next 30 percent of room rates
- Economy: next 20 percent of room rates
- Budget: lowest 20 percent of room rates

In terms of ownership, hotels are either independently owned and operated or franchised by a larger corporation.

Lodging operations have a tendency to focus on different types of customers. Firms divide consumers into market segments, leisure or business travelers, and attempt

to cater to those markets. The implication is that firms cater to specific customer needs in terms of hotel location and pricing. Courtyard by Marriott, for example, targets business travelers through site selection, marketing, and amenities.

Within the scope of lodging research, some basic themes receive much attention. The primary emphasis is placed on economic performance and success. Lodging researchers are often concerned with how the industry can financially improve operations, and therefore focus on the five key measures of supply (number of rooms available), demand (number of rooms sold), occupancy, average daily room rate, and revenue per available room (Lomanno, 1998). Another area of research deals with overall lodging operations and management. However, much insight for this thesis will be gleaned from the attention location receives in lodging research. Lodging research investigates location in a variety of ways. In fact, the three most important attributes in the lodging industry are widely considered to be location, location, location (Arbel and Pizam, 1977; Lundberg, Stavenga, and Krishnamoorthy 1995; Gunn and McIntosh, 1964; Wyckoff and Sasser, 1981; Lewis, 1985; Jakle, Sculle, and Rogers, 1996). The role of location will be discussed in greater detail later in the chapter.

#### **2.2.5. Conclusion**

The lodging industry is a key component of the tourism industry. To put the lodging industry in an appropriate context, the discussion focused on the tourism industry's economic impact and importance. While geography has a role in tourism, researchers note the lack of attention tourism research receives in geography. Moreover, a lack of geographic emphasis exists in the lodging industry. A few basic concepts in the

lodging industry were discussed while highlighting dominant areas of lodging research. Many researchers fail to empirically examine location's role in the industry. While previous efforts are briefly combined and summarized in Pearce (1995), many researchers studying the lodging industry give little attention to the role of geography. Furthermore, the role of location on price has been limited. It is therefore appropriate to examine location's role within lodging research.

### **2.3. Location and Lodging**

#### **2.3.1. Introduction**

To better understand location's role in the pricing dynamics of hotel rooms, it is necessary to examine how location is portrayed in the lodging literature. Location is a significant factor in lodging operations. Thus, lodging research is concerned with location in a variety of ways: supply (number of rooms available) and demand (number of rooms sold), site selection, financial performance, consumer choice, and marketing strategy. However, geographic concepts are rarely the central theme in the lodging literature. Conceptually, location can be framed in terms of the basic geographic concepts of site and situation. Thus, previous efforts that are underscored by a site and situation framework are highlighted.

#### **2.3.2. Location's Significance**

The spatial structure of the lodging industry is significant for a number of reasons. First, locational decisions have long-term consequences for a property's success. Wyckoff and Sasser (1981) note that location affects the competitive market by altering the supply and demand relationship. They interviewed lodging operators and concluded

that location was the most important feature in a purchase decision. Wise location decisions will positively affect a hotel's success. Once a site is selected, acquired and developed, there is no turning back. Jakle, Sculle, and Rogers (1996) illustrate this point in a case study of Albuquerque, New Mexico. They note that the legendary U.S. Route 66 influenced the rise of more than one hundred motels along Albuquerque's fourteen-mile stretch of the highway. Subsequently, these motels declined as a result of the introduction of the federal interstate highway system. Lodging establishments became isolated from main flows of traffic, lost business, and ultimately deteriorated with age.

Bull (1994) places importance on location because it is the only fixed attribute in the lodging product. Such attributes as service, amenities, and design are all variable. However, location is a complex attribute. Each location has advantages and disadvantages over another location. Thus, Bull suggests that location's stationary and complex attributes are necessary considerations in marketing and product strategies. Bull argues that the importance of location becomes evident in price as well. Although managers intuitively may know a "good" location increases the value of room price, they rarely can determine exactly how much location can add to or subtract from price in an effort to keep their occupancy rate at standard market levels.

The spatial structure of the lodging industry is also significant because lodging facilities have an impact on a community by attracting convention-goers and other visitors (Reilly, 1988). Location will influence the type of consumers who use certain establishments based on their diverse needs. For example, urban locations might tend to

attract a majority of business and leisure travelers. Conversely, facilities located along interstates generally cater to travelers "passing through."

### **2.3.3. Location and how it is examined**

Most attention that location receives in the lodging literature concentrates on five themes: supply and demand, site selection, financial performance, consumer choice, and marketing. The first theme focuses on hotel supply and demand. Locational factors are inherent ingredients in the supply and demand relationship of hotels. If supply (number of rooms available) does not meet increasing demand (number of rooms sold) over a period of time, hotel room prices will likely rise (Lundberg, Krishnamoorthy, and Stavenga, 1995). Supply is affected by the spatial behavior of lodging firms while demand is affected by the spatial behavior of consumers. According to Culligan (1990), three factors comprise the lodging supply equation: (1) the existing base of competitive hotels, (2) additions to the competitive hotel supply, and (3) deletions from the competitive supply. Pearce (1995) summarizes the general patterns of the distribution of hotels. His supply-side analysis focuses on how changes in the urban landscape affect the geography of hotels. He notes that the location of hotels reflect the demand generated by other functions. Thus, changes in the distribution of hotels reflect changes in demand. Similarly, Goss-Turner (1996) suggests that the spatial pattern of hotels is determined by the level of economic activity, or by the characteristics and needs of the demand created by business. The demand for hotel rooms is based on specific market segmentation needs (Gee, Makens, Choy, 1989; Law, 1993). For example, Law (1993) notes that industrial cities with high proportions of manual jobs are likely to require fewer hotel rooms than

other cities. Thus, location is an important consideration in the supply and demand relationship.

The second theme in the literature centers on site selection. Wyckoff and Sasser (1981) note that for one president of a large national motel chain the key to success for the lodging industry is location (site) selection. One goal of site selection for that particular chain involved clustering their properties. They prioritized preferred locations in the following order: airports, interstate highways, office complexes/industrial parks, medical centers, and then major universities. Thus, location is a component of the business strategy equation. Site selection in the mid-1980's, for example, used a niche marketing strategy. Motel firms often selected sites where full-service hotels/motels were located and economy motels were unavailable (Goodman, 1986). Rather than simply stating that location is important to a hotel's success, Gunn and McIntosh (1964) argue that the five location principles necessary for site selection are:

- Nearness to travel objectives
- Nearness to community services
- Ease of access
- Economically suitable land
- Suitable site characteristics

The recent literature, however, does not explicitly build upon Gunn and McIntosh's suggestion. Nevertheless, the significance of location is apparent in hotel site selection.

A third theme dealing with location is financial performance. For example, Higley (1998) reports that developers who locate hotels at airports enjoy financial success. However, the lodging industry is often cyclical in nature. Financial success is linked to national and regional economies. Thus, occupancy rates rise and fall with the

economy (Lundberg, Krishnamoorthy, and Stavenga, 1995). Analysis involving location is one performance measure occasionally reported by lodging consultants such as Smith Travel Research. For example, properties on the East and West coasts tend to perform better than those located in the central U.S. (Lomanno, 1997 and 1998). Moreover, further analysis revealed that, for 1997, the best performing markets in the U.S. were the northeast corridor between Philadelphia and Boston, and, in the West, the San Francisco Bay area (Lomanno, 1997). While Lomanno's results are interesting, his analysis offered little insight in explaining spatial successes (in terms of profit). STR's analyses emphasize the performance of the lodging industry yet it would be beneficial to understand the factors causing the results.

Recognizing the importance of measuring performance by location, STR segments their lodging data into specific location types: urban, suburban, airport, highway, or resort. Lomanno (1998) advises that assigning specific properties to each category may not be precise, however he feels it does reflect trends within each property type. This market segmentation is also noted in Law (1993) and Gee, Makens, and Choy (1989). Unfortunately, the relationship of locational segments and room rates is not empirically examined.

Additionally, STR performs analyses from a regional perspective by combining census regions and chain market segments (i.e., economy, mid-price, upscale, etc. lodging establishments). For example, after tracking occupancy for a twelve-month period ending in February 1998, little regional variation existed for economy chains as compared to upper-scale chains and all properties as a whole (Lomanno, 1998).

Wyckoff and Sasser (1981) suggest that the size of cities influences success. Based on 1977 data, they report larger cities have a higher ratio of room revenue to total revenue than smaller city counterparts. They attribute this to more food facility choices and higher costs associated with maintenance, property tax, and insurance. Although financial performance of lodging firms takes location into account, further empirical analysis can help shed light on location's role.

Consumer choice emerges as the fourth theme in the literature. One important component to consider in the room rate and location equation is the consumer. "Depending on the purpose of travel ... the choice of accommodations may be highly price sensitive or somewhat insensitive ... (T)he industry of today is highly segmented in terms of the wide variety of lodging options available and the types of markets served." (Gee, Makens, Choy, 1989). Studies note location's role as the determining factor in consumer choice (Mayo, 74; Cadotte and Turgeon, 88; Bull, 94). In contrast, Lewis (1985) argues that location is not a strong determinant in hotel choice for business travelers. However, he notes that location's lack of importance is because all the hotels in his sample are essentially in the same location. Lewis and Nightingale (1991) suggest that an anomalous location and amenity effect sometimes develops due to multiple hotel choices in a given area. In this situation, analyses of guest surveys show consumers place less weight on location, amenities, and other attributes. Instead, service relative to customers' needs is argued as an attributable factor. Specifically, services must be focused on customers' needs and their willingness to pay for them. Excess services, or those that don't return value, can lead to consumers choosing limited service franchises

over more expensive, upscale motels/hotels. However, the authors qualify that service investments can fail when copied by the competition. Lewis and Nightingale suggest that hotel firms recognize that amenities don't substitute for real service and that frequent-guest programs will not attract guests to places where they are not willing to stay.

In the fifth theme, location plays a key role in hotel marketing. Marketing strategy and advertising illustrate an establishment's reliance on location. According to Gunn and McIntosh (1964), three factors help shape a market analysis: (1) types of guests to serve, (2) geographic location from which guests are attracted, and (3) the amount of business obtained with present facilities or upgraded facilities.

Notable emphasis on location in marketing strategy exists in terms of lodging promotion and prices. For example, in hotel brochures some franchises categorize a site as interstate, downtown, airport, or suburb. Others highlight perceived locational advantage to popular tourist sites, while other brochures account for the business-traveler market by listing distance to major firms. Brochures commonly list distance to restaurants, universities, museums, and other points of interest. Perhaps an advertisement for a Wilshire, California Ramada Inn appropriately sums up industry marketing strategy. The advertisement boasts across the top: "Location, Location, Location." This theme more than likely reflects countless other advertisements attempting to lure consumers.

#### **2.3.4. Lack of geographic research**

Despite the role geography plays in the lodging industry, a lack of empirical geographic emphasis exists in the majority of lodging research efforts. However, a few notable exceptions do exist. Arbel and Pizam (1977) focus on how tourists react to the

location of their hotels in terms of travel time from the city center of Tel Aviv, Israel. Their research was based on 300 tourist interviews. They argue that there is a low sensitivity of rate to distance. Tourists in the sample were willing to travel distances of 15 to 20 minutes without corresponding reductions in room rate. Arbel and Pizam suggest tourists simply want to avoid the urban city center and are willing to stay farther away from main attractions while paying comparable city center rates. Van Doren and Gustke (1982) provide another geographic contribution to the literature. The authors examine the spatial distribution of the lodging industry. Their analysis focuses on state and standard metropolitan statistical area (SMSA) growth (i.e., supply) of hotels from 1963, 1972, and 1977. Data are based on lodging receipts for each state and all SMSA's and cities. The authors note the states and metropolitan areas that had the greatest growth.

#### **2.3.5. Site and Situation**

Although the lodging literature examines location in a variety of ways, a site and situation framework is absent. Site and situation are traditional geographic concepts used to describe location. It is argued that marketing efforts in lodging implicitly highlight site and situation factors to promote hotels. Thus, the site and situation framework provides the theoretical underpinning of this thesis. Recent geographic research emphasizing site and situation is scarce. However, it is worthwhile to briefly highlight prior research that is explicitly grounded in a site and situation context.

It can be argued that site and situation concepts are implicitly evident in lodging advertising and marketing. From a site standpoint, hotel amenities are listed for each hotel in brochures and advertisements. Amenities such as pools, meeting rooms, and

restaurants are considered to be site variables. Likewise, situation factors are highlighted in brochures and advertisements. Often, hotels are classified by their situation. For example, airport hotels are located at or near airports or convention hotels are located near convention centers. Situation attributes are also introduced in the form of distance to local points of interest. Thus, both site and situation variables are implicitly promoted in an effort to attract consumers. Unfortunately, prior lodging research pays these variables little or no attention.

Wilder (1985) found that land use change is influenced not only by land use itself, but by site and situation factors as well. For Wilder, site characteristics included parcel acreage, building floor space, and age of residential structure. Situation was measured in terms of distance from the peak land value intersection in the city. Miller and O'Kelly (1990) suggest that site and situation factors are important in determining consumer patronage of retail centers. The authors account for site and situation effects on market area delimitation. McCalla (1998) sets out to determine if site or situation factors are more dominant in explaining the growth and prosperity of cruise ship seaports. However, his content analysis made it difficult to confirm if situation was the most important factor. Finally, Fotheringham and Dignan (1984) examine site and situation variables in the context of gravity models. The authors suggest that trip generation and trip attraction models reflect the relative importance of site and situation variables in determining outflow and inflow totals.

### **2.3.6. Conclusion**

The spatial distribution of hotels is an important factor in the lodging industry. Location is often portrayed in the lodging literature in terms of room supply and demand, site selection, financial performance, consumer choice, and marketing strategy. Thus, location is a significant consideration in lodging operations. However, geographic concepts are rarely the central theme in lodging research. Location can be theoretically captured in terms of a site and situation context. As a result, a site and situation framework lends itself to the systematic investigation of hotel room rates. Studies that use a site and situation framework have been highlighted. It is argued that few such empirical studies explicitly concentrate on location and hotels. Likewise, a substantial amount of literature linking location to room pricing is absent.

## **2.4. Pricing**

### **2.4.1. Introduction**

Room rates are the prime source of income for hotels and a prime consideration for price-sensitive consumers. Room-rate pricing should be an important consideration in lodging research. The existing research primarily focuses on how room rates are established. However, the literature suggests that there is no ideal method to establishing room rates. Moreover, few empirical investigations attempt to uncover the determinants of room rates in a spatial context. In an attempt to reveal the causes of room rate variations across space, methodological insight is gleaned from housing research. Specifically, attention is devoted to the housing literature's methodological foundation

and the role of location in determining house prices. Research that most closely resembles this thesis is highlighted to provide an empirical point of departure.

#### **2.4.2. Establishing room rates**

Empirical investigations of room rate determinants are scarce in the literature. Rather, research primarily centers on how Average Daily Rates (ADR's) are established and how rates can maximize firm profits. ADR's are total revenue divided by number of rooms sold. Historically, common methods for establishing room rates were three types: the \$1 per \$1000 rule, the Hubbart Formula, and management decisions. Today, yield management receives the most attention, however debate continues as to which pricing technique is the most beneficial to the firm. Ultimately, firms' objectives are to maximize profits by charging a rate that will bring the most profit but is not high enough to prevent attracting guests (Lundberg, 1979).

In general, traditional pricing strategy relies on charging one dollar per one thousand-dollars invested (to include construction and equipment cost) (Reilly, 1981; Relihan, 1989; Lewis, 1986; Lundberg, 1979). However, evidence could not be found to determine if this strategy is still employed. The Hubbart Formula serves as an alternative approach for determining ADR's. According to Lundberg, Krishnamoorthy, and Stavenga (1995) and Lundberg (1979), the formula's objective is to cover all operating costs while providing a 15 percent profit on investment. To obtain an ADR, the total annual revenue required to cover all costs and a 15 percent profit return on investment is divided by the projected number of rooms that will be sold in the coming year. This technique receives little attention in the literature. As a result, use of the Hubbart

Formula in the industry is not clear. Gunn and McIntosh (1964) suggest that rates have to cover costs but costs are not the basis for determining rates. The most common practice of establishing room rates, however, was when hotel managers determined their prices relative to the competition (Relihan, 1989; Gunn, 1964). Arbel and Woods (1991) suggest that profit is affected when supply variables, such as competition, are introduced.

Today, yield-management, similar to that of the airline industry, is the common industry technique. The purpose of yield-management is to maximize revenues by adjusting room rates in response to market conditions (i.e., demand). Relihan (1989) presents four approaches to applying yield management in the hospitality industry. First, the threshold approach adjusts room rates by comparing actual demand with an anticipated or forecasted threshold value. This approach requires knowledge of a hotel's booking history. Second, Relihan cautions the use of artificial intelligence systems in forecasting expectations due to the dynamic nature of the hotel environment. Third, he examines the use of optimization. Optimization draws from mathematical algorithms to identify the single, exact price based on time and place. Finally, at the time of publication, neural networks were in their infancy and Relihan alludes to their potential in applying yield management techniques.

Similar to the airline industry, cost structures are very dynamic and responsive to demand. As a result, management may turn to discounting to fill beds. For example, it is common for one consumer to pay one price for a night's stay while a consumer in the identical room next door pays a reduced rate. Discounting is a common practice in the industry, however some researchers regard discounting and room pricing as complex,

“unscientific,” and “lacking methodology” (Lewis, 1986; Hanks, Cross, and Noland, 1992; Lewis and Shoemaker, 1997; Lundberg, Krishnamoorthy, and Stavenga, 1995). Discounting, or tiered pricing, is the result of marketing competition and seasonal lulls (Gee, Makens, and Choy, 1989).

Discounting is sometimes viewed as a business stimulant for both business and pleasure travel markets. However, Lewis (1986) cautions the industry's practice of discounting. He notes that the hotel industry is one of the few industries that increases prices when its product does not sell. Increased prices result in the need to discount to attract consumers. Discounts can lead to confusion for consumers, and thus, profits suffer. Rather, Lewis suggests that room rates should be set with the customer in mind. He proposes two ways to accomplish this. First, he reminds the industry that marketing should be customer-focused and that pricing, like advertising and selling, is a marketing tool. Second, the industry should respond better to supply and demand via improved marketing and pricing strategies. Ultimately, Lewis suggests that being honest with customers, in terms of pricing, will avoid losing hotel business.

To better grasp the complexity of pricing, Lewis and Shoemaker (1997) suggest measuring consumers' price sensitivity before room rates are established. However, variability across services, size, amenities, and location present difficulty. Furthermore, price is often seen as an indicator of quality. Lewis and Shoemaker recommend using the price sensitivity measurement technique to determine how consumer perceptions of value are affected by the interaction of price and quality. It is noted that “cost-driven pricing” is a common pricing strategy in the hospitality industry. Lewis and Shoemaker credit

Peter Drucker as suggesting the preferred pricing strategy as “price-driven costing.” In this system, price begins at what the market is willing to pay and is then designed around that determinant. Thus, for the hospitality industry, after uncovering how much customers are willing to pay for a night’s stay, a room-rate threshold can be determined. Marriott, with its Courtyard product, is one example of a company embracing this strategy. Consumer research identified a preferred price threshold and a set of desirable attributes or services customers were willing to pay for. As a result, room rates were set accordingly. Price sensitivity measurement allows a marketer to determine where the price of a particular product or service falls in relation to the range of acceptable prices. Thus, a price of indifference can be determined between two locations. Finally, Lewis and Shoemaker warn that a price can be set too high (i.e., priced out of the market) and too low (i.e., low price might be perceived as low quality). Carroll (1986) is another skeptic of discounting as the sole means to success. He presents data showing that discounting has not been the measure for profit. Instead, similar to Lewis (1986), he advocates pricing to be one component in a larger marketing strategy that includes promotion, advertising, and customer focus.

Dunn and Brooks (1990) caution that yield-management is useful for short-term profitability. In the long term, however, they suggest that pricing strategy should include more analysis on profit margins. They present the market segment profit analysis technique (MSPA), which focuses on cost management by assessing costs incurred to support the sales of specific market segments (i.e., food and beverage, banquet, etc). The strength of MSPA is that it combines marketing and financial objectives with the

strategic-planning process. Profit analysis by segment (PABS) is a similar technique. It examines the average revenues for different market segments then analyzes the contribution of each by accounting for the cost of the different segments (Quain, 1992). Both MSPA and PABS are probably most useful in larger hotels with numerous market segments. Thus, their application is of little use in the budget motel segment.

Other attempts at solving lodging price complexity take a macro, industry-wide approach. For example, empirical rental adjustment models suggest that hotel rental rates are influenced by shifts in hotel occupancy over time (Wheaton and Rossoff, 1998). Room rates have been shown to be a function of market demand (e.g., luxury vs. economy hotels) and production costs (Hartman, 1989). Arbel and Woods (1991) found that hotel industry pricing decisions from 1975 to 1989 were based on the general rate of inflation. Research also indicates that inflation was the primary cause for annual rate of change in hotel room rates from 1958 - 1977 (Arbel and Strebel, 1980). Wyckoff and Sasser (1981) suggest that lodging operations have a cost structure that is a function of unit age, location, size, range of services offered, class, occupancy, as well as whether the unit is franchised or not. Unfortunately, Wyckoff and Sasser do not provide empirical evidence for their lodging price determinants.

It is evident that much debate surrounds the best approach to room pricing. The common assessment of pricing strategy as complex and unscientific is perhaps an accurate depiction of industry practice and is the reason for continuous debate. Nowhere is location explicitly addressed in the accounts presented here. Bull (1994) argues that location must be considered in room rate pricing rather than the common pricing

approach of yield management. A cursory examination of published room rates in hotel chain directories clearly reveals price variations across space. Furthermore, Carvell and Herrin (1990) argue that "pricing schemes have largely ignored the implicit prices of some attributes offered by hotels." Clearly, geographic factors have a role in determining room rates and the literature that recognizes this is discussed later in the chapter.

#### **2.4.3. Hedonic pricing and geographic research**

The primary focus of this thesis is the variation of hotel room rates across space. One area of similar pricing research that receives considerable attention in the literature is housing price studies. The common trait for both types of products is that prices vary across space. Often the products themselves (i.e., hotel room or house) are similar from one location to another, yet their prices will differ. The price differential is presumably influenced by locational attributes. It is the role of location on price that interests geographers and regional scientists. Many theoretical and methodological similarities exist between housing price research and the objective of this thesis. Thus, much insight is gained from housing research. As a result, a review of some essential principles inherent in housing research is appropriate.

Many empirical housing studies group attributes into three general categories to explain house prices: physical characteristics of the house; neighborhood (external) effects; and market conditions (Hughes and Sirmans, 1992). Waddell, Berry, and Hoch (1993) and Burt and Barber (1996) suggest three categories as well, yet replace market conditions with location (e.g., distance to central business district). Similarly, this thesis extends the context of the three categories -- house characteristics, external effects, and

location -- into a site and situation framework. Thus, site may be examined in the context of house characteristics and situation in the context of neighborhood (external) effects and location.

The influence of accessibility on the variation of land and housing prices is widely studied in economic and geographic research. For example, researchers are critical of the traditional monocentric model which suggests that house prices (or apartment rent) decrease as distance from the central business district (CBD) increases (e.g., Hoch and Waddell, 1993; Waddell, Berry, and Hoch, 1993; Dubin and Sung, 1987). Li and Brown (1980) consider the value of distance to nonresidential land use. They note that most accessibility research accounts for the variation of land prices in one region or across the rent gradient. Using hedonic analysis, they show how certain nonresidential land uses provide positive values for accessibility and negative values for other variables, such as neighborhood externalities. Hughes and Sirmans (1992) analyze the effects of traffic levels on single-family housing prices. Their results indicate that high levels of traffic have a significant negative impact on housing prices.

With a few exceptions, my methodological approach of hedonic modeling is derived from the housing price literature. A few notable contributions to the lodging literature complement the large corpus of housing price literature employing hedonic analysis (Wu, 1998; Bull, 1994; Sinclair, Clewer, and Pack, 1990; Carvell and Herrin, 1990; Hartmen, 1989; Corgell and DeRoos, 1992). The lodging literature that employs hedonic analysis is further discussed in Chapter 4. Hedonic price estimation examines the price of a product, such as a hotel room, and divides it into implicit prices for the

components of the product. The components or attributes of the product are considered implicit because consumers do not actually break down the components of the price (Burt and Barber, 1996). Hedonic analysis has found tremendous utility in effectively examining the determinants of housing prices (a small sample includes; Can, 1990; Can, 1992; Dubin, 1991; Cheshire and Shepperd, 1995). Specifically, an enormous effort has focused on examining housing price variation across space. Surprisingly, however, little research has been conducted examining hotel room price variation across space.

Although housing involves a purchase with long-term consequences, house and hotel room prices are influenced by many similar factors.

#### **2.4.4. Key research**

Few researchers have synthesized the inherent objective of this thesis. The most notable exceptions are found in Wu (1998), Carvell and Herrin (1990), Sinclair, Clewer, and Pack (1990) and Bull (1994). These four investigations are similar in that they estimate the implicit prices of hotel attributes. Their analyses include a host of variables hypothesized to influence room rates. Geographic variables, of varying degrees, are included in their data sets. Although their theoretical assumptions differ, the methodology is the same in that they employ the hedonic price function.

Wu (1998) analyzes price variation between franchised and independent motels to uncover whether franchises enjoy price premiums. He investigates motels in Arkansas and Kansas towns with 20,000 people or less. Aside from including a variable for motels located on interstates, he purposely avoids locational variables in his analysis. Furthermore, Wu hypothesizes that other determinants of motel prices, which can be

considered "situation" variables, may exist but are not included due to lack of data.

Perhaps the results of his models would improve if he accounted for location.

Carvell and Herrin (1990) suggest that amenities influence room rates. The authors examine the implicit prices of hotel amenities for 20 hotels in San Francisco from 1982 through 1986 using ADR's as the dependent variable. Their hedonic model accounts for both business and pleasure travelers by including amenities that cater to each group, both individually and collectively. Unfortunately, Carvell and Herrin only introduce one geographic variable in their analysis, distance from each hotel to Fisherman's Wharf.

Sinclair, Clewer, and Pack (1990) estimate the prices of holiday packages using hedonic analysis. Hotel characteristics are among the sets of variables considered in their study. The authors' incorporate locational variables in terms of hotel centrality and picturesque location. They point out that location is not only important in terms of the study's resorts but in terms of the location of the hotel within the resorts. Sinclair, Clewer, and Pack suggest that further research on the relationship between location and pricing of tourist accommodation and facilities is valuable.

Apparently, the only research that explicitly focuses on location and hotel pricing is Bull's (1994) investigation of 15 motels in Ballina, Australia. Bull employs hedonic analysis to estimate the values of motel attributes at market rates. However, his small sample leads to serious limitations in generalizing the model because it does not include a large enough set of observations to have confidence in the results. The findings produce values for three attributes: motel rating, presence of a restaurant, and distance from the

city center. Originally the model included motel age and side of the highway, however, the variables proved to have poor correlations within the model and insignificant contributions to variance. The hedonic price function estimated a value for each attribute and room rate could be predicted based on whether it had one or more attributes.

#### **2.4.5. Conclusion**

The best approach to establishing hotel room rates lacks consensus. Moreover, research is limited on the determinants that influence room rates. Housing price research has many similar methodological underpinnings to this thesis. The literature on pricing models attempts to uncover implicit attribute prices that help determine the final (house or room) price. Typically, researchers group the determinants into several categories. It is argued that those determinants, or variables, can be placed in a site and situation framework. Site variables are analogous to structural variables in housing studies (for example, see Can, 1990; Li and Brown, 1980; Cheshire and Sheppard, 1995) and analogous to quality variables in lodging studies (Wu, 1998). Similarly, situation variables are analogous to neighborhood attributes/effects in housing studies (Can, 1990; Li and Brown, 1980). Thus, this thesis categorizes determinants as either site or situation variables. It is the site and situation framework that links geography to the hotel room rate gradient. Finally, similar empirical investigations that focus on the determinants of room rates were briefly discussed to provide a point of departure.

## 2.5. Conclusion

Insight for this thesis is gleaned from three primary themes of relevant literature -- the lodging industry as a component of tourism, the relationship between location and lodging, and room pricing. Each theme is a major consideration in studying the site and situation determinants of hotel room rates. As a foundation, the lodging industry was examined by first considering it as a component in the tourism industry. A review of the literature concentrating on the two inherent components of this thesis, location and price, was then undertaken.

It was found that (1) little geographic attention is devoted to the tourism and lodging industry, (2) empirical analysis of location in lodging research is scarce, and (3) no clear consensus on room pricing strategy exists. In conclusion, research on the spatial pattern of hotel room rates has largely been ignored and geographers can perhaps contribute to our understanding of this phenomenon.

## CHAPTER 3

### DATA

#### 3.1. Introduction

The data employed in the analysis are based on the hypothesis that hotel room rate is a function of site and situation. Thus, the independent variables are categorized as either site or situation attributes. Site variables account for the actual attributes of the hotel, whereas situation variables are attributes relative to the hotel's location. Examining explanatory variables in a site and situation context helps bring a geographic focus to hotel prices. For example, amenities such as a pool and spa are not inherently geographic attributes. The geographic relationship emerges when the variables are grouped together to describe a specific location relative to another location.

As with most geographic studies, the question of scale surfaced in the course of this investigation. Separate geographic scales permitted the inclusion of different variables for analysis. Indeed, some variables are more readily acquired for a larger scale study. For example, land values can be easily acquired for a relatively small geographic area like Tucson, Arizona. In contrast, obtaining land value data for hundreds of locations across four states would be difficult. Pearce (1995) recommends a multi-scale approach, one that incorporates and integrates different levels of analysis. Coincidentally, preliminary research was conducted at the regional level. The results led me to conduct similar research at the local level. However, the change of geographic scale permitted the inclusion of variables that better explain the spatial variation of hotel

room rates. Two separate empirical analyses are employed in this thesis. As a result, two different data sets are employed. The first set of data corresponds to room rates at the regional level, while the second set of data corresponds to room rates at the local level.

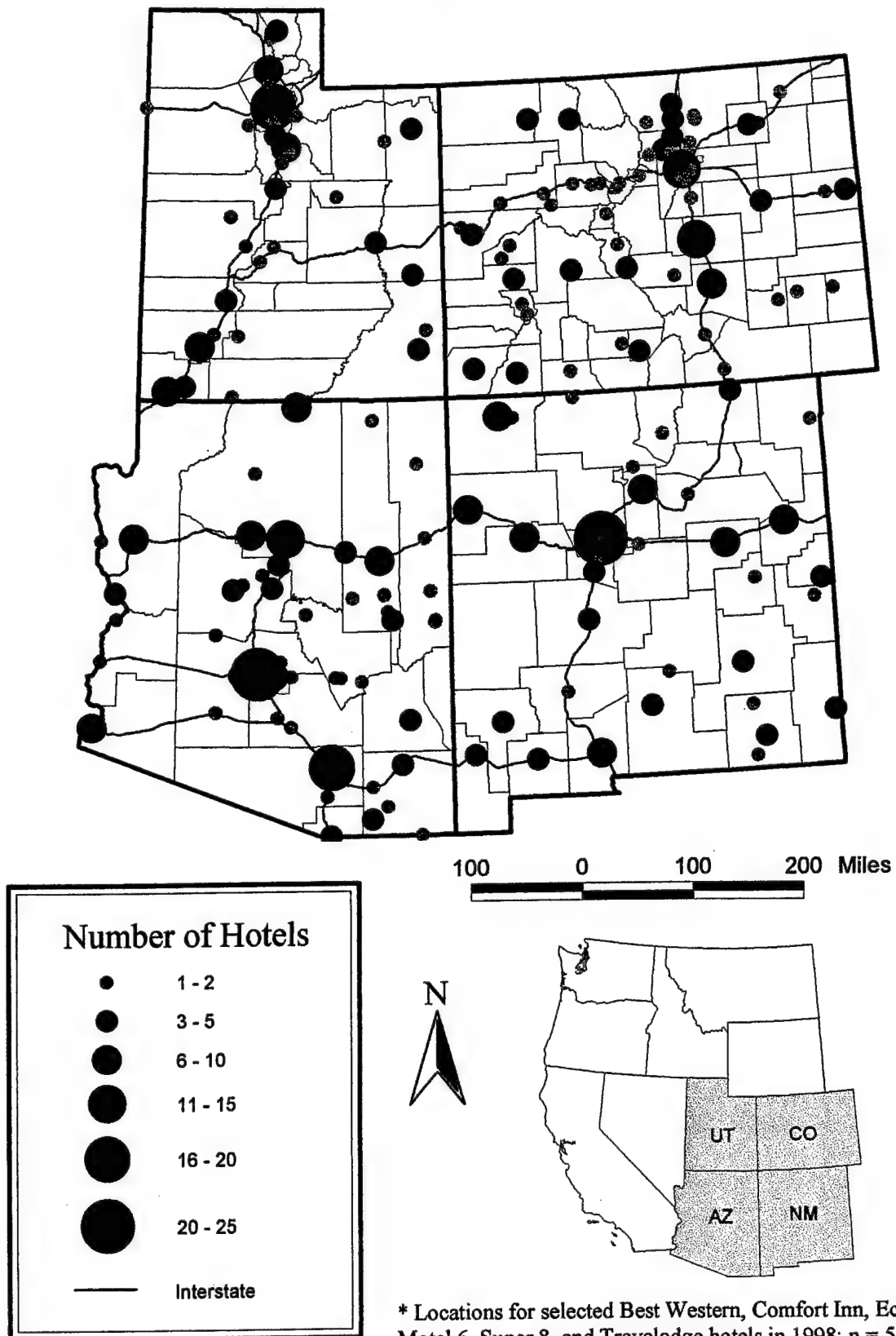
### **3.2. Regional Scale**

#### **3.2.1. Object of Study**

The regional data consist of hotels and their attributes in the Four-Corner states: Arizona, Colorado, New Mexico, and Utah. Specifically, 1998 room rates for 584 hotels, representing six hotel chains, are examined. This region was chosen because of data availability and a variety of cities with diverse seasonal climates. According to the 1992 Economic Census, the four states' hotels and motels have 176,387 guestrooms (nearly 6% of the nation's total). Two of the thirty largest hotel markets in 1998 are included in this study: Phoenix, ranked 11<sup>th</sup>, and Denver, ranked 21<sup>st</sup>. These rankings are based on Smith Travel Research's hotel census database and ranking of the total supply of hotel rooms (STR, 1999). Figure 3.1 depicts the study area and the number of hotels in the sample.

Lodging type is often categorized by average daily room rate. The lodging chains in the regional sample fall into one of three STR price segment categories. According to STR's lodging classification categories, the hotels are in the mid-price, economy, and budget categories. As previously noted, these three categories consist of the industry's lower 70 percent of average daily room rates. However, preliminary analysis indicates that the room rate difference between the chain with the lowest average room rate and the chain with the highest average room rate differs only by approximately \$20.00. The

# Regional Sample of Hotels\*



\* Locations for selected Best Western, Comfort Inn, Econolodge, Motel 6, Super 8, and Travelodge hotels in 1998; n = 584

chains include Best Western, Comfort Inn, Econolodge, Motel 6, Super 8, and Travelodge. These chains were chosen because of data availability and because they are well distributed throughout the four states.

### **3.2.2. Source and definition of variables**

The dependent variable is the 1998 published room rate for each of 584 hotels. Room rates were obtained from national directories of the six hotel chains. Standard room rates are often published as a minimum and maximum price range for any given time period, rather than a single price. Thus, local managers have the ability to raise and lower prices within the range of rates. As a result, prices are derived by averaging the single occupancy published room rates for stay between Sunday and Thursday. Hotel operators often charge more during the weekends, holidays, and special events. Nevertheless, published rates serve as an objective price because, regardless of market conditions, all consumers are exposed to the published rates.

The physical geography of the study area presents optimal seasons at varying times of the year for each hotel location. Room prices will fluctuate due to seasonal variability. For example, the Phoenix off-season occurs during the summer months and the Grand Canyon's peak season occurs during the summer. Thus, hotel demand and room rates in Phoenix would tend to be lowest in the summer, whereas the Grand Canyon's demand and rates would be highest in the summer. Figures 3.2 through 3.5 illustrate a comparison between lowest and average published room rate for each hotel by state. Average summer room rates are graphed in ascending order. The remaining prices are illustrated and reflect the amount of variation with respect to average summer rates.

Pearce and Grimmeau (1985) found that fluctuations in hotel demand are the result of seasonal variation. Reilly (1988) suggests that demand fluctuates with season as well. Therefore, to account for seasonality, summer and winter room rates serve as dependent variables for respective operational models.

Conceptually, four optimal room rates, one for each season, would be useful to analyze. However, a further complication with the available hotel directory data is a lack of consistency in seasonal prices. For example, hotel chain  $x$  in city  $Z$  charges its lowest rate from June 1<sup>st</sup> to September 15<sup>th</sup>, and hotel  $y$  in city  $Z$  charges its lowest rate from June 15<sup>th</sup> to August 15<sup>th</sup>. An even further complication sometimes occurs when hotel chain  $x$  in city  $Z$  has different seasonal prices than a hotel of the same chain in city  $Z$ . Therefore, room prices are weighted and seasonally adjusted for their dominant price in the months of June and July (summer price -- SP) and November and December (winter price -- WP). Each season is divided into four quarters and the room price for each quarter is combined to produce a weighted summer and winter price. The following equation accounts for the dependent variable when room rates are published as a price range rather than one price and two different prices ranges are listed for any given season (June and July or November and December):

$$SP \text{ (or WP)} = [((s_j + h_j)/2)i + ((s_j + h_j)/2)i]/4$$

where

$s_j$  = low published rate for  $j$ th quarter of two-month season

$h_j$  = high published rate for  $j$ th quarter of two-month season

$i$  = weighting factor; number of times (1,2,3, or 4) average room rate occurs in two-month season

Figure 3.2. Arizona Room Rates, 1998

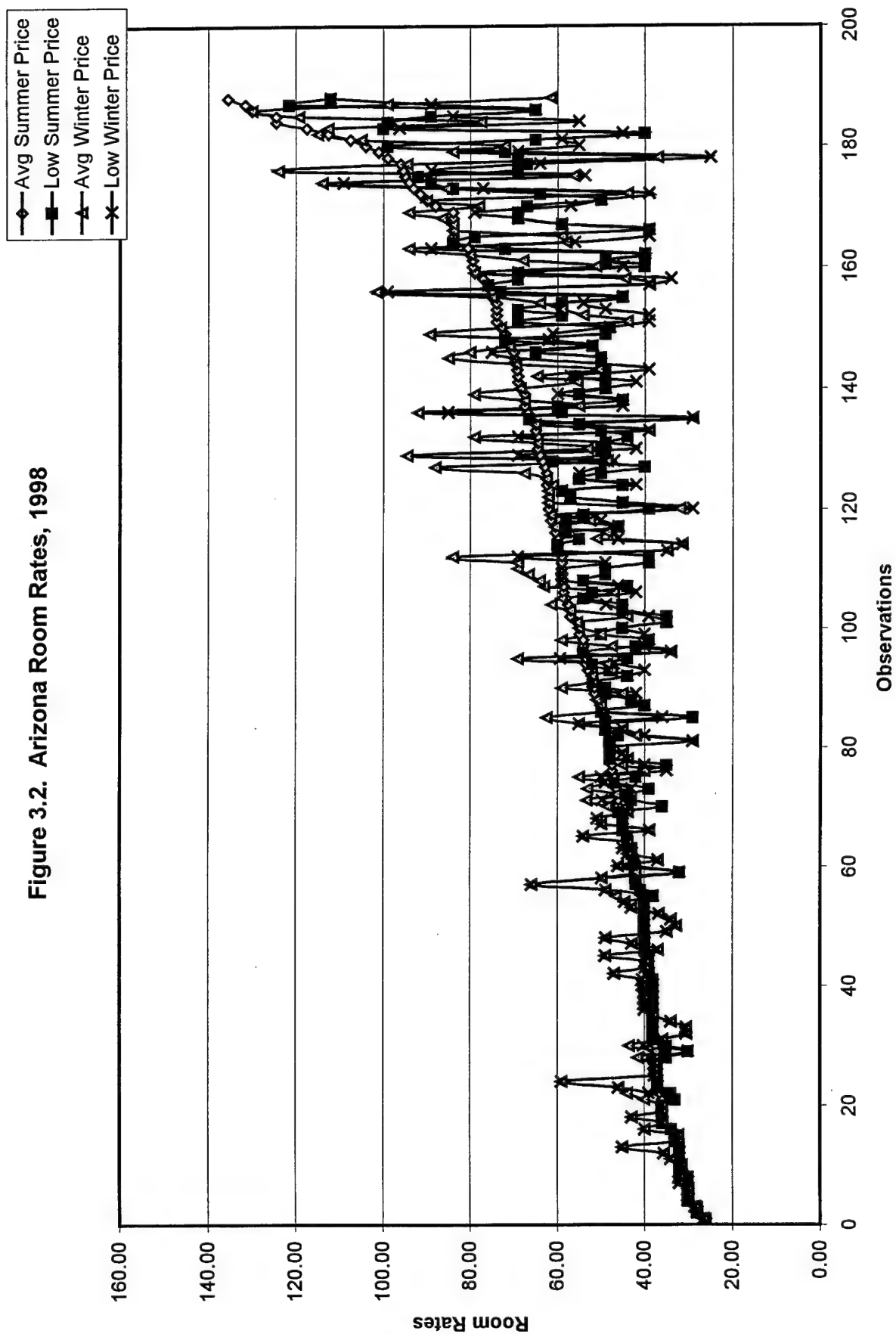


Figure 3.3. Colorado Room Rates, 1998

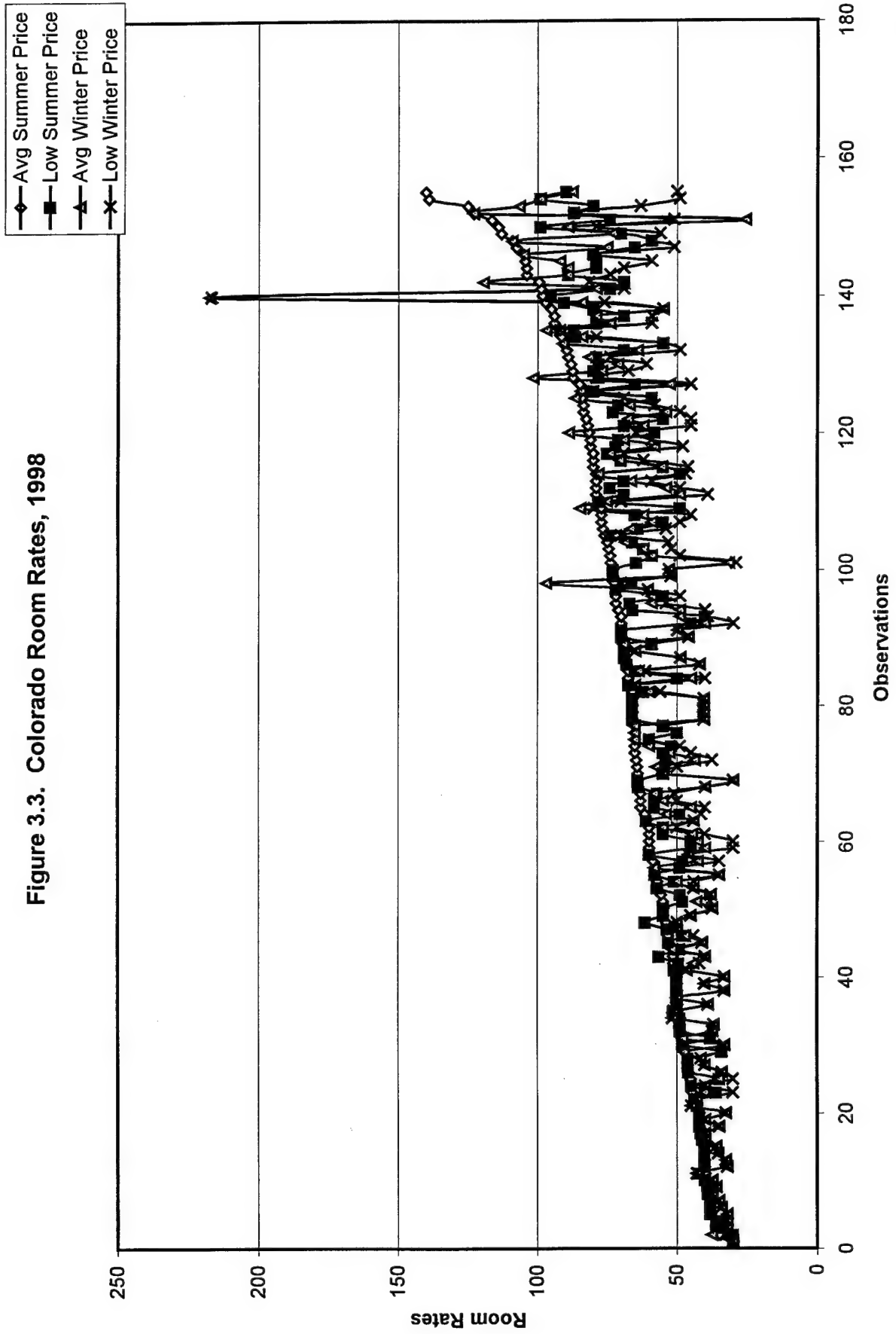


Figure 3.4. New Mexico Room Rates, 1998

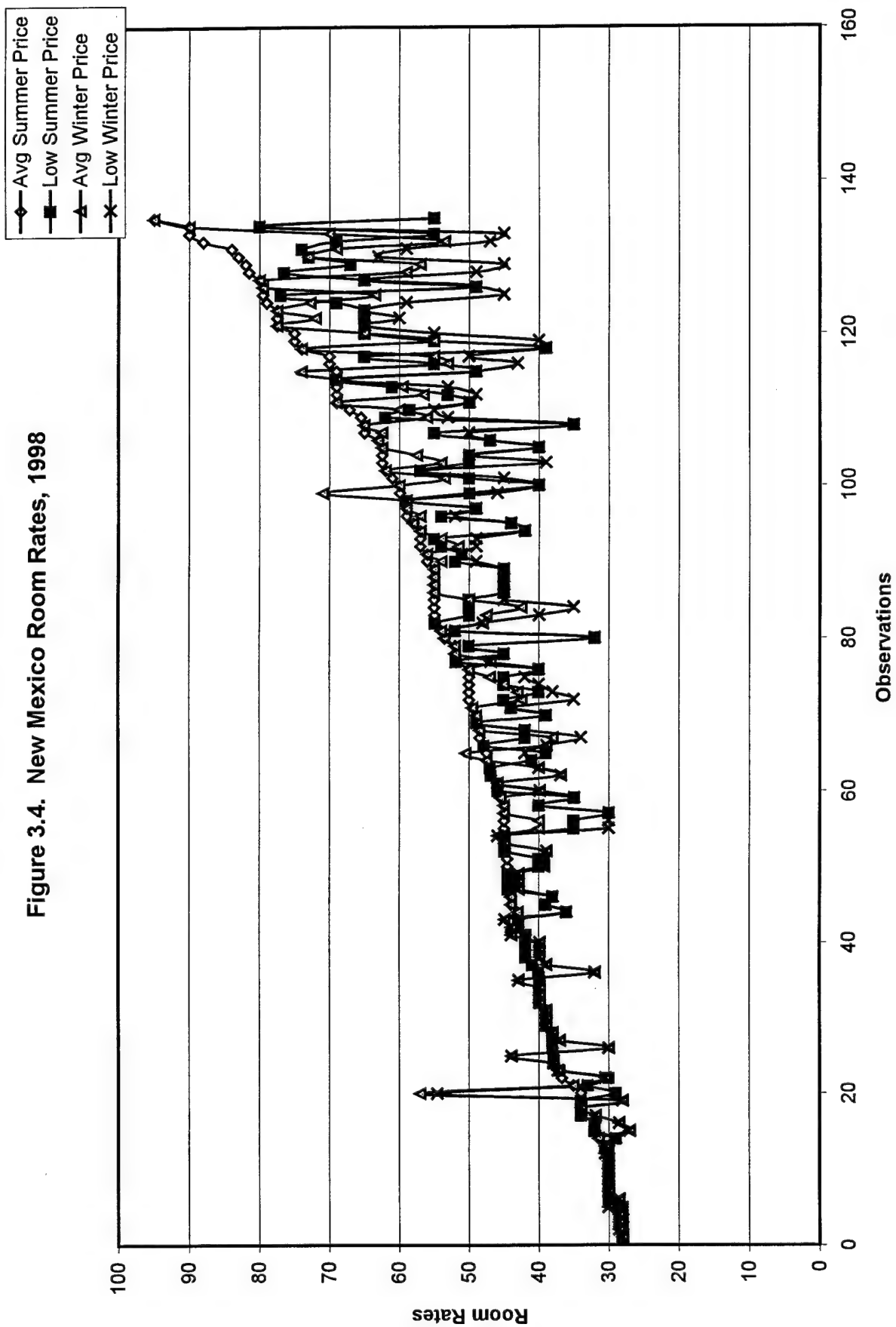
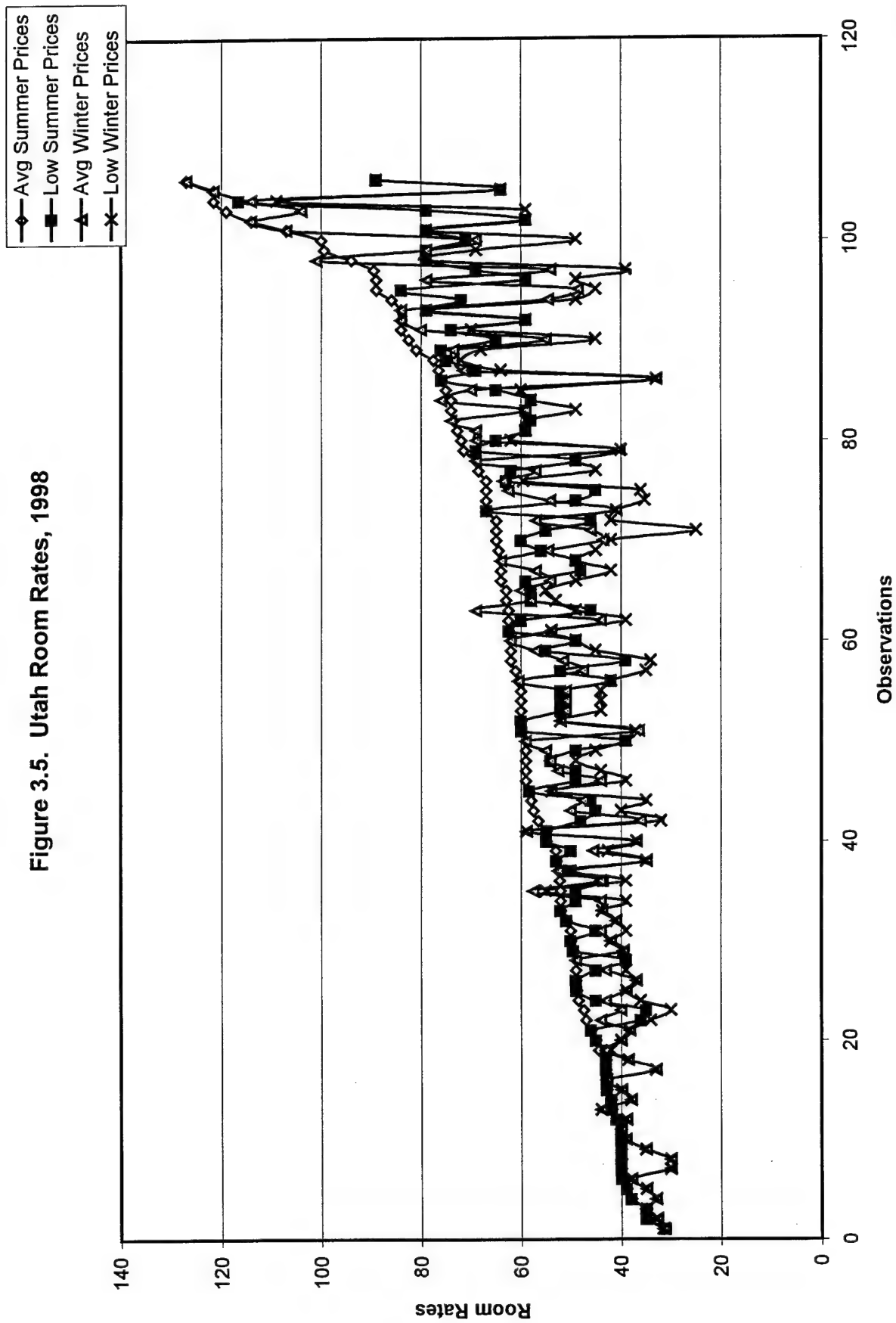


Figure 3.5. Utah Room Rates, 1998



The independent variables are categorized as either site or situation variables.

Table 3.1 summarizes the operational definitions of the variables. The data were obtained from a variety of sources. In general, the data show a large variation in room rates, particularly in winter prices. Summer room rates range from \$25.99 to \$140.13, with an average price of \$60.03 and a standard deviation of \$21.38. Winter room rates range from \$25.50 to \$217.50, with an average price of \$54.19 and a standard deviation of \$20.66. Table 3.2 provides descriptive statistics for all the variables in the study.

The first group of variables captures site attributes. In general, site variables represent characteristics of each hotel. Data were obtained from the respective hotel directories. The second group of variables captures situation variables. Table 3.3 summarizes the expected signs of the associated parameters. All the site attributes that are considered hotel amenities are hypothesized to positively influence room rates, *ceteris paribus*. The variables POOL and SPA take on the value of 1 if the hotel has a pool and spa, and the value of 0 otherwise. The variable BRKFST takes on the value 1 if the hotel provides, at a minimum, a complimentary continental breakfast. POOL, BRKFST, and SPA are expected to increase the establishment's expenses. As such, the additional expenses are expected to be passed on to consumers via higher room rates. Likewise, the more rooms in a hotel, the more expenses are expected.

The site variables also include hotel chain dummy variables. It is hypothesized that different hotel chain room rates are dissimilarly influenced by the variables in the model. Moreover, some of the hotel chains are members of the same parent corporation.

TABLE 3.1. - Regional Variables and Their Definitions

Variable	Description
<b>Price (Dependent)</b>	
SP	Average (single occupancy) room rate for Jun-Jul 1998
LOWSP	Low (single occupancy) room rate for Jun-Jul 1998
WP	Average (single occupancy) room rate for Nov-Dec 1998
LOWWP	Low (single occupancy) room rate for Nov-Dec 1998
<b>Site</b>	
POOL	Dummy variable for hotel with a pool
BRKFST	Dummy variable for complimentary continental breakfast
SPA	Dummy variable for motel with a spa, jacuzzi, or whirlpool
ROOMS	Number of rooms in hotel
BW	Dummy variable for Best Western Motels
EL	Dummy variable for Comfort Inn
M6	Dummy variable for Motel 6
S8	Dummy variable for Super 8 Motels
TL	Dummy variable for Travelodge Motels
<b>Situation</b>	
STEMP	Average temperature (degrees Farenheit from 1961-1990) for Jun-Jul 1998
STEMP^2	Average summer temperature squared
WTEMP	Average temperature (degrees Farenheit from 1961-1990) for Nov-Dec 1998
WTEMP^2	Average winter temperature squared
ISTATE	Dummy variable for interstate hotel
ROOM%	% share of rooms by zip code
METRO	Dummy variable for hotel located in metropolitan statistical area
INC	Median family income by county, 1989
EMP	% service & retail trade employment share of county's total employment, 1997

This may indicate that hotel chain x and y owned by firm Z might target different markets, thus pricing and site attributes may vary. For example, Choice Hotels International owns Comfort Inn and Econolodge. It is possible that Comfort Inn, on average, has different room rates and amenities than Econolodge. To account for this, hotel chain dummy variables are introduced. The dummy variables take on the value of 1 if the hotel is affiliated with the respective national chain, and the value of 0 otherwise. This provides insight to how each chain is influenced by the remaining variables in the

TABLE 3.2. - Descriptive Statistics for Regional Hotel Data

Variable	Count	Mean	Maximum	Minimum	Standard Deviation
SP	584	60.03	140.13	25.99	21.38
LOWSP	584	51.72	121.50	25.99	15.39
WP	584	54.19	217.50	25.50	20.66
LOWWP	584	46.75	216.75	25.00	15.25
<b>Site</b>					
POOL	584	0.79	1	0	0.41
BRKFST	584	0.41	1	0	0.49
SPA	584	0.41	1	0	0.49
ROOMS	584	80	393	23	45.01
BW	192	0.33	1	0	0.47
EL	40	0.07	1	0	0.25
M6	91	0.16	1	0	0.36
S8	138	0.24	1	0	0.43
TL	37	0.06	1	0	0.24
<b>Situation</b>					
STEMP	584	74	94	52	8
STEMP^2	584	5571	8822	2730	1259
WTEMP	584	40	59	21	9
WTEMP^2	584	1669	3534	431	796
INTSTE	584	0.47	1	0	0.5
ROOM%	584	0.46	1	0.04	0.33
METRO	584	0.52	1	0	0.5
INC	584	29,475	91,811	10,678	6,913
EMP	584	0.49	0.67	0.29	0.06

model. BW and S8 represent the two largest chains (in terms of number of properties) of the six chains studied. A “monopoly” effect is expected on room rates to allow for price increases because BW and S8 have a larger share of room supply.

The situation variables are expected to have both positive and negative effects on rates. It is hypothesized that hotels on interstates are in competition to attract travelers “passing by.” An interstate location is expected to have a negative effect on room rates.

**TABLE 3.3. - Expected Effect on Regional Hotel Room Rates**

<b>Variable</b>	<b>Summer Price</b>	<b>Winter Price</b>
<b>Site</b>		
POOL	+	+
BRKFST	+	+
SPA	+	+
ROOMS	+	+
BW	+	+
EL	-	-
M6	-	-
S8	+	+
TL	-	-
<b>Situation</b>		
STEMP	+/-	N/A
STEMP^2	+/-	N/A
WTEMP	N/A	+/-
WTEMP^2	N/A	+/-
ISTATE	-	-
ROOM%	+	+
METRO	+/-	+/-
INC	+	+
EMP	+	+

The value ISTATE takes on the value of 1 if the hotel is depicted as an interstate hotel in the directory, and the value of 0 otherwise.

Metropolitan areas may influence room rates differently than rural areas. Thus, as a crude form of measurement, a dummy variable is included to account for hotels located in Metropolitan Statistical Areas (MSAs). Hotels located in metropolitan areas are presented with competing factors that can potentially have a positive or negative impact on room rates. Factors such as more competition, greater room supply and demand,

higher employment costs, and higher land value/rents are all hypothesized to have different affects on rates. Therefore, no expectation exists for METRO.

The percent of rooms in an area may influence room rates as well. Specifically, the percent share of rooms (for each hotel) by zip code is included. It is hypothesized that the larger the supply of rooms in a hotel, the more it can charge for a room. To account for seasonality, average temperature for the months corresponding to seasonal room rates is included. It is hypothesized that the relationship between temperature and room price is nonlinear. To account for the nonlinear relationship, the model includes average temperature and average temperature squared as variables. Climate data were obtained from the Western Regional Climate Data Center and represents average temperatures for each city from 1961 - 1990.

The geographic scale presents a multitude of diverse economic structures that will influence room rates in various ways. For example, key tourist destinations are expected to charge a premium for accommodations. Economies that are reliant on tourism generally have a high percentage of service and retail trade employment. Thus, a percentage of the county's service and retail trade sector employment serves as a crude form of measurement for economies that are more reliant on tourism. This measure is expected to have a positive effect on room rates. A priori, hotels in tourist areas tend to charge a premium for rooms. The variable EMP represents each hotel's county service and retail trade employment share of total employment for 1997. Employment data were obtained from the Bureau of Economic Analysis. Median family income is included to measure socioeconomic status of the county where the hotel is located. It is hypothesized

that a high income area will result in higher room rates. Income data were obtained from the 1990 U.S. Census Summary Tape File 3A.

### **3.2.3. Data Limitations**

It is important to note the limitations associated with this particular data set. First, published room or rack rates are not the most precise measure of actual price charged for a room. Ideally, average daily room rates (ADR's) would be a more useful dependent variable. However, lodging and consulting firms are traditionally reluctant to provide the proprietary data. Specific lodging firms report time series ADR's (e.g. monthly, quarterly, etc.) to lodging consultants, such as Smith Travel Research, but the data are proprietary and costly. ADR's account for discounting and yield management yet does not take geography into account. A consumer can potentially receive the same discount regardless of location. Wu (1998) suggests that published rates are a good approximation if discounts are identical across hotels. Moreover, discounting is not a constant, guaranteed occurrence like published rates. Thus, consumers may or may not receive a discounted rate. Nevertheless, the only room rates to which consumers are exposed are those listed in hotel directories. As a result, two possibilities exist – pay the rack rate or pay a reduced rate. Ultimately, discounted prices are not influenced by geography. In contrast, rack rates vary across space. In light of this, data are obtained from hotel directories to serve as an objective measure of price.

Second, a complication with using hotel directories as the source of room rates is that some directories publish a price range rather than one explicit price. A published room rate, for example, could range from \$59.00-\$109.00 for any given time period.

Therefore, two types of dependent variables are employed. Averages of room rates will be calculated where applicable, as well as the inclusion of the lowest published room rate. The lowest room rate will capture the baseline price and yet continue to reveal the spatial variability phenomenon.

### **3.3. Local Scale**

#### **3.3.1. Object of Study**

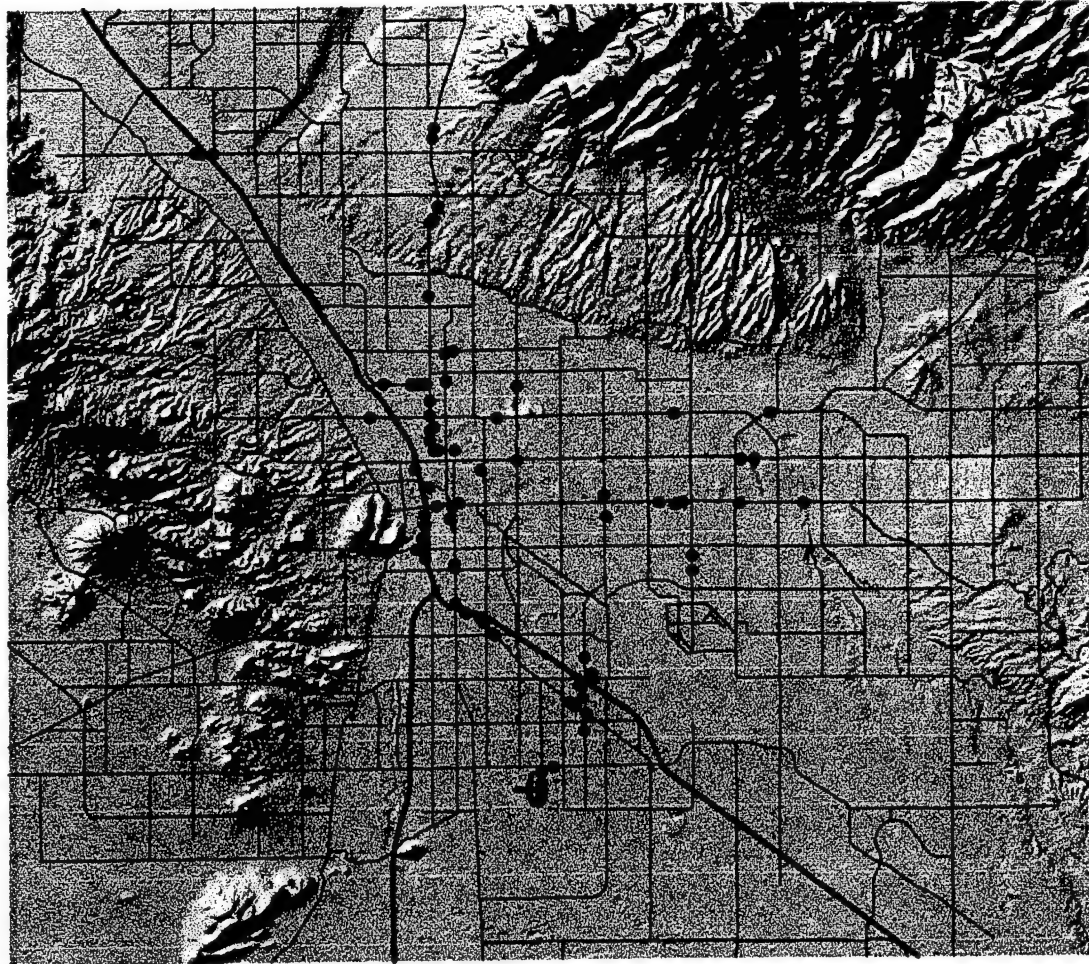
The local scale data are a sample of 1999 lodging establishments from Tucson, Arizona. The hotel address data were obtained from Select Phone-1999, 2<sup>nd</sup> Edition, a commercially available electronic business database. Originally, 131 lodging establishments were retrieved from the national database. However, certain establishments, such as resorts, ranches, bed and breakfasts, and weekly rentals were excluded. These lodging firms typically attract a different market share than “typical” hotels and motels. Thus, the excluded establishments quite possibly may have combinations of services and amenities that influence price structures differently than hotels and motels. The Tucson sample differs from the regional sample of hotels by including establishments not affiliated with national hotel chains. Additionally, there is a larger variation in size, amenities, and markets. As a result, the lodging establishments in the Tucson sample are representative of all the STR price-segment categories. However, the inclusion of a wider variety of hotel types is necessary to keep the sample size sufficiently large enough for statistical analysis. The remaining 98 addresses were geocoded in a Geographic Information System (GIS). The addresses were matched to a

street network database obtained from the 1999 Pima County Land Information System (PCLIS). Figure 3.6 illustrates the spatial distribution of the hotels in Tucson.

### **3.3.2. Source and definition of variables**

Room rates were obtained by calling all establishments. The rates reflect the price for a basic room with one adult for a one-night stay. To minimize price inflation, November 18, 1999, was chosen to represent a "typical" room rate period. The assumption is that a weeknight, not a holiday or during a special event, might capture a "typical" price. Figure 3.7 depicts the actual room rate for each establishment in the sample. Room rates range between \$19.95 and \$124.00, with an average price of \$55.01 and a standard deviation of \$26.20. In general, the data show that room rates are uniformly distributed within the range of prices. Figure 3.8 shows the spatial pattern of room rates for November 18, 1999. In general, the map suggests that hotels tend to cluster together in certain areas of Tucson, and that room rates are not randomly distributed across town. Clusters of similar room rates exist, for example, near Tucson International Airport and along Interstate 10.

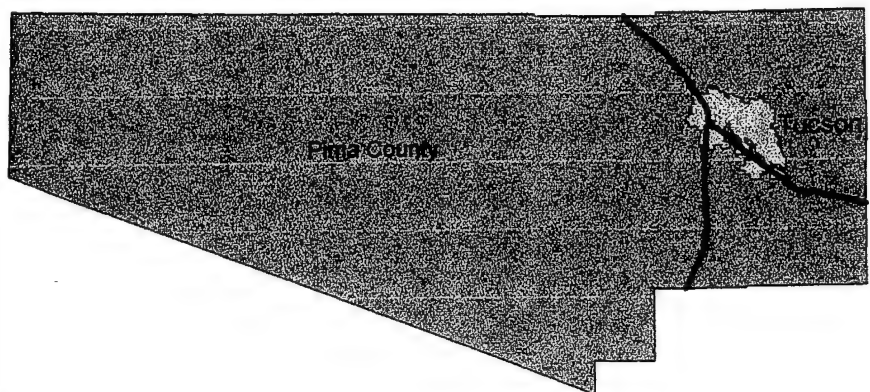
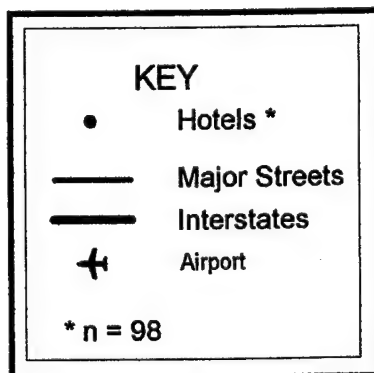
## Selected Tucson Hotel Locations

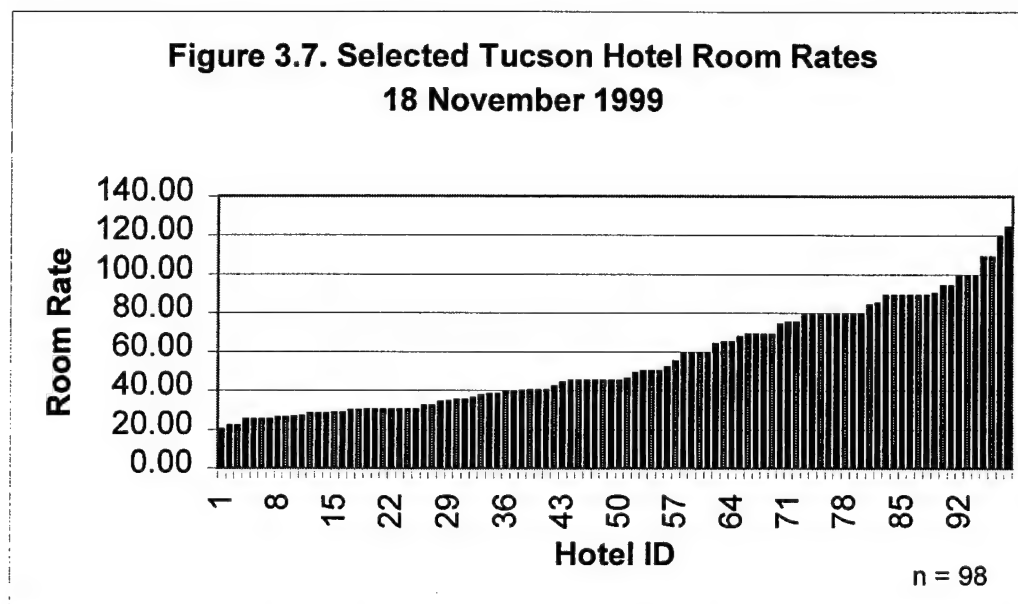


5 0 5 10 Kilometers

A horizontal scale bar with alternating black and white segments, marked with the numbers 5, 0, 5, and 10, representing kilometers.

UTM Projection  
Patrick J. White  
6 Dec 99

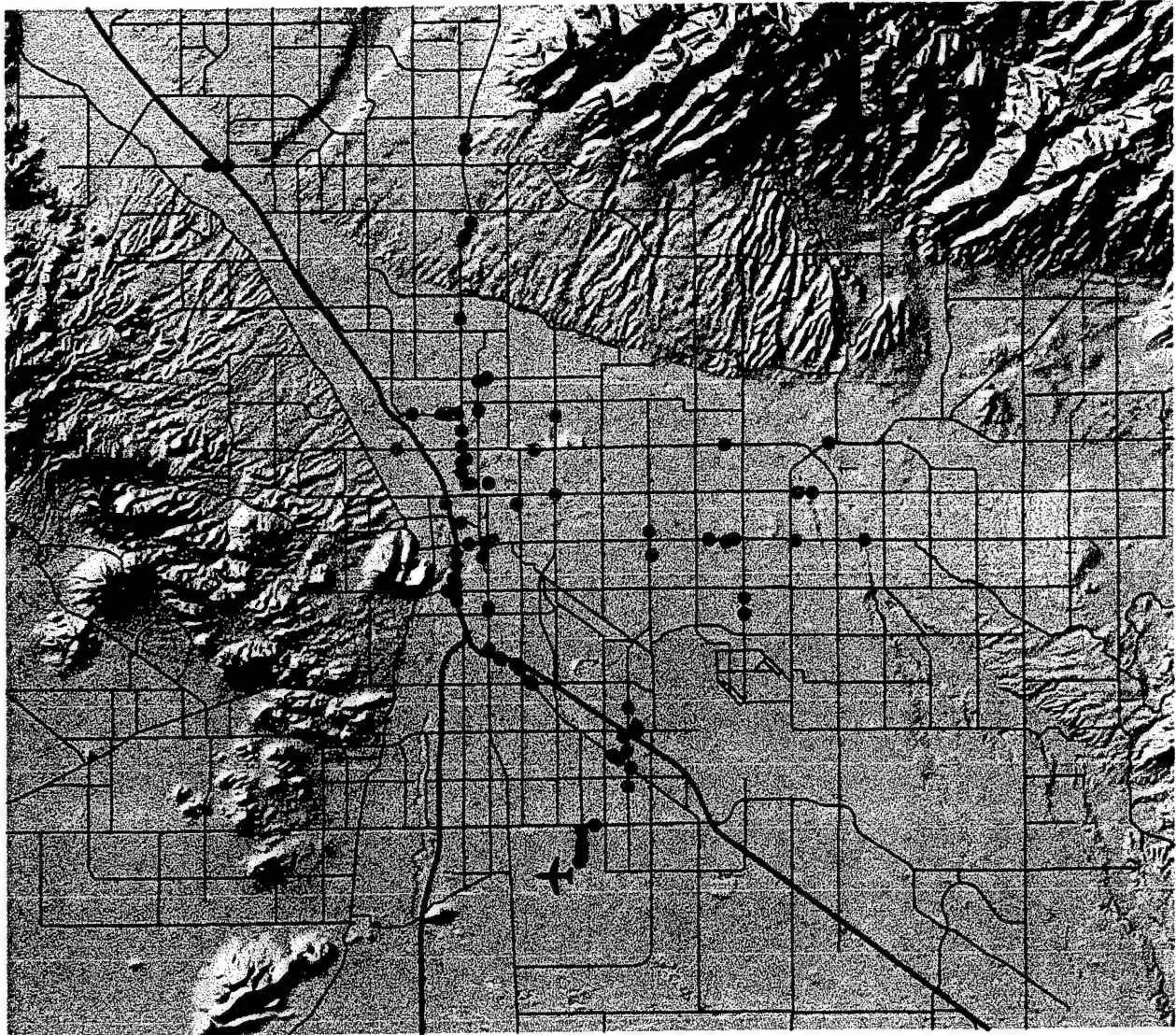




The variables are categorized as either site or situation variables. Table 3.4 summarizes the operational definitions of the variables. The larger geographic scale permits the inclusion of different variables that were omitted in the regional sample. The data were obtained from a variety of sources. Table 3.5 provides descriptive statistics for all variables in the study.

The expected signs of the parameters are presented in Table 3.6. The first group of variables captures site attributes. In general, site variables represent characteristics of each hotel. Two variables include common amenities found in modern hotels. POOL and BRKFST data were obtained from telephone interviews and national directories. The value POOL takes on the value of 1 if the hotel has a pool, and the value of 0 otherwise. The variable BRKFST takes on the value 1 if the hotel provides, at a minimum, a

# Tucson Hotel Room Rates



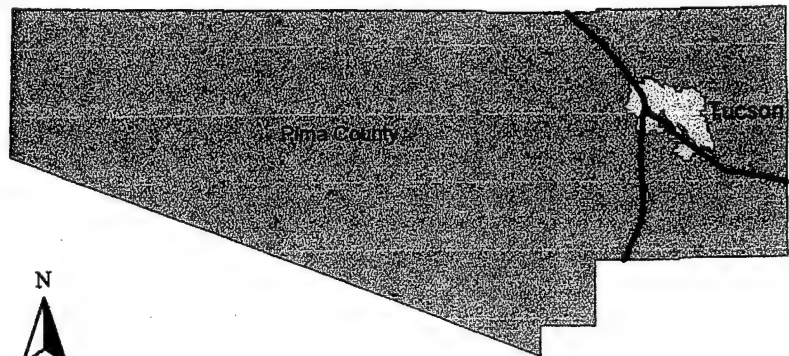
UTM Projection  
Patrick J. White  
6 Dec 99

## Hotel Room Rates \*

- \$ 19.95 - 28.50
- \$ 28.50 - 39.99
- \$ 39.99 - 59.00
- \$ 59.00 - 85.00
- \$ 85.00 - 124.00

- Major Streets
- Interstates
- ✈ Airport

3 0 3 6 Kilometers



\* Room rates are reported for November 18, 1999; n = 98

TABLE 3.4. - Local Variables and Their Definitions

Variable	Description
<b>Price (Dependent)</b>	Single occupancy room rate for November 18, 1999
<b>Site</b>	
POOL	Dummy variable for hotel with a pool
BRKFST	Dummy variable for complimentary continental breakfast
ROOMS	Number of rooms in hotel
ROOMSQ	(ROOMS) <sup>2</sup>
AGE	Age of hotel (in years)
AGESQ	(AGE) <sup>2</sup>
CHAIN	Dummy variable for hotel chain
LANDVL	Assessed land value in year 2000 (in 1000's)
ONE	Dummy variable for hotel with AAA 1 diamond rating
TWO	Dummy variable for hotel with AAA 2 diamond rating
THREE	Dummy variable for hotel with AAA 3 diamond rating
<b>Situation</b>	
ISTATE	Straightline distance to Interstate (in kilometers)
UA	Straightline distance to UA (in kilometers)
AIRPORT	Straightline distance to Airport (in kilometers)
AIRP_SQ	(AIRPORT) <sup>2</sup>
INC	Household income by census block group, 1989 (in 1000's)
ROOM%	Percent share of rooms by census tract
MUSEUM	Straightline distance to Desert Museum (in kilometers)
STUDIOS	Straightline distance to Old Tucson Studios (in kilometers)
PIMAAIR	Straightline distance to Pima Air Museum (in kilometers)
SABINO	Straightline distance to Sabino Canyon (in kilometers)
TCC	Straightline distance to Tucson Convention Center (in kilometers)
MISSION	Straightline distance to San Xavier Mission (in kilometers)
ZOO	Straightline distance to Reid Park Zoo (in kilometers)

complimentary continental breakfast. The presence of these amenities is expected to have a positive effect on room rates; *ceteris paribus*. The Pima County Assessor's office provided the structural variables AGE and ROOMS for approximately 92 hotels. The remaining hotels were called to obtain the necessary information. AGE is expected to

TABLE 3.5. - Descriptive Statistics for Tucson Hotel Data

Variable	Count	Mean	Maximum	Minimum	Standard Deviation
PRICE	98	55.01	124.00	19.95	26.20
<b>Site</b>					
POOL	98	0.84	1.00	0.00	0.37
BRKFST	98	0.52	1.00	0.00	0.50
ROOMS	98	99.15	299.00	11.00	69.23
ROOMSQ	98	14575.23	89401.00	121.00	19518.89
AGE	98	28.34	62.00	2.00	17.50
AGESQ	98	1106.26	3844.00	4.00	1097.61
CHAIN	98	0.63	1.00	0.00	0.48
LANDVL	98	435.265	2097.620	28.819	397.253
ONE	98	0.05	1.00	0.00	0.22
TWO	98	0.19	1.00	0.00	0.40
THREE	98	0.35	1.00	0.00	0.48
<b>Situation</b>					
ISTATE	98	2.73	11.98	0.00	3.08
UA	98	6.47	16.27	0.73	3.70
AIRPORT	98	12.41	27.24	0.40	6.35
AIRP_SQ	98	194.01	742.10	0.16	173.64
INC	98	19.690	55.633	5.527	10.994
ROOM%	98	0.35	1.00	0.03	0.33
MUSEUM	98	21.59	32.11	14.08	4.30
STUDIOS	98	17.94	28.11	12.74	3.83
PIMAAIR	98	13.64	29.38	5.51	5.69
SABINO	98	17.12	23.70	7.37	3.78
TCC	98	6.48	15.89	0.28	4.21
MISSION	98	15.33	26.93	6.96	5.24
ZOO	98	7.48	20.22	1.20	3.66

have a negative effect on room prices. Thus, consumers can expect to pay more for newer hotels. It is hypothesized that the variable ROOMS will have a positive parameter. Additional rooms are expected to increase hotel expenses, a priori, with the extra expenses reflected in room rates. Thus, the larger the hotel, the greater the room rate.

**TABLE 3.6. - Expected Effect on  
Tucson Hotel Room Rates**

<b>Variable</b>	<b>Expected Sign</b>
<b>Site</b>	
POOL	+
BRKFST	+
ROOMS	+
ROOMSQ	+
AGE	-
AGESQ	+
CHAIN	+
LANDVL	+
ONE	+
TWO	+
THREE	+
<b>Situation</b>	
ISTATE	+
UA	-
AIRPORT	-
AIRP_SQ	-
INC	+
ROOM%	+
MUSEUM	-
STUDIOS	-
PIMAAIR	-
SABINO	-
TCC	-
MISSION	-
ZOO	-

AGE and ROOMS are expected to have a nonlinear relationship with room rate. As such, both variables are squared. The variable LANDVL represents the Year 2000 assessed land value for the parcel or set of parcels for each hotel. The data were provided by the Pima County Assessor's office as well. All things being equal, the assessed value of the hotel's land should positively affect room rate<sup>1</sup>. Type of hotel ownership is

<sup>1</sup> Land Improvements Value was also considered. However, the variable was highly correlated with LANDVL and did not yield improved results.

expected to influence room rates (Wu, 1998; Wyckoff and Sasser, 1981). Thus, the dummy variable CHAIN is introduced. CHAIN takes on the value of 1 if the hotel is affiliated with a national firm, and the value of 0 otherwise. It is hypothesized that chain-affiliated hotels will charge more for rooms due, in part, to franchise fees and greater marketing expenses (Wu, 1998; Wyckoff and Sasser, 1981).

The final site variable captures overall hotel quality using the American Automobile Association's (AAA) diamond rating system. Data on hotel quality are obtained from the AAA Tourbook, a publication provided by the AAA. AAA's rating system is a measure of overall quality in a lodging's amenities and service. The rating considers the size, age, and overall appeal of an establishment. Each increase in a diamond level represents an increase in the degree of quality and service. It is hypothesized that hotels with a one-, two-, or three-diamond rating will charge more for a room than hotels that are not AAA-rated. From the sample, 58 hotels are rated one, two, or three diamonds. Thus, hotels can be grouped in one of four possible categories. The remaining 40 hotels fall within the "not-rated" category. As such, a total of three dummy variables, for each quality level, are introduced. ONE takes on the value of 1 if the hotel has a AAA one-diamond rating, and the value of 0 otherwise. TWO and THREE follow the same criteria.

The second group of variables captures situation attributes. In general, the situation variables represent neighborhood and relative locational characteristics of the hotel. The larger geographic scale permits the inclusion of distance measurements to various Tucson points of interest. Distance measurements, using GIS, represent straight-

line distances from each hotel to specific attractions in kilometers. The distance scale equates one unit with one kilometer. All attractions are considered to be points of interest that attract tourists. Marketing efforts such as advertisements, brochures, and hotel directories often list attractions in the vicinity of specific hotels. As a result, it is hypothesized that distance to attractions is expected to have an inverse relationship to room rates. As distance increases, room rates are expected to decrease. The attraction variables include one of Tucson's most popular tourist attractions, MUSEUM. The coordinates of the Tucson Convention Center (TCC) approximate the Central Business District. It is expected that distance to the airport has a nonlinear relationship with room rate. To account for this relationship, the model includes distance to airport squared as a variable. Similar to the regional study, hotels on interstates are expected to have lower room rates than those not on the Interstate. Thus, as distance from the Interstate increases, room rate is expected to increase.

INC serves as a crude measure of socioeconomic status. Median household income, at the census block group level, is included to represent socioeconomic status. In their housing price study, Li and Brown (1980) utilize income to proxy for omitted characteristics, such as aesthetic quality and other desirable attributes correlated with income. It is expected that higher income areas will positively influence room rates. The percent of rooms in an area may influence room rates as well. Specifically, the percent share of rooms (for each hotel) by census tract is included. The larger the proportion of rooms any one hotel has, a priori, the more it can potentially charge for a room. Hotels with a large share of rooms are expected to control price in the surrounding area.

### **3.3.3. Data Limitations**

Similar to the regional study, ADR's are the desirable price variable.

Unfortunately, ADR's for each hotel are not available to the public. As such, the dependent variable represents only one point in time. Thus, the results reflect the relationship between room rates and the variables for one day. It is possible that November 18, 1999 serves as a typical time period; however, it is difficult to prove. Consequently, a temporal examination of room rates may be more representative of typical market conditions. Nevertheless, the existing data will provide useful information.

## **CHAPTER 4**

### **METHODOLOGY**

#### **4.1. Introduction**

This research employs hedonic analysis to examine the systematic variation of hotel room rates across space. Hedonic analysis is a form of price estimation that takes the price of an aggregate product and divides it into implicit prices for the components of the product. The hedonic price regression is constructed from the multivariate regression model, which regards a market product as a bundle of separately measurable attributes. The attributes are represented as variables in hedonic models and their parameters are considered implicit prices. Each parameter represents a single variable's effect on the market product.

Hedonic theory is summarized extensively in Rosen (1974). Hedonic analysis is a widely used technique in housing-price research. Often researchers are interested in determining the implicit prices of house price components. Though hedonic analysis receives less attention in the lodging literature, a few researchers have used it to determine the implicit prices of hotel attributes. Some authors assess the value of location in addition to other hotel attributes (Wu, 1998; Bull, 1994; Sinclair, Clewer, and Pack, 1990; Carvell and Herrin, 1990). Hartman (1989) extends hedonic analysis to identify luxury hotel pricing and design strategies and Corgell and DeRoos (1992) construct price indices of lodging properties using hedonic pricing models. Although not explicitly hedonic methodology, Lewis (1985) employs regression analysis to assess the

value of location and price in relation to hotel choice among business travelers.

Similarly, Ellerbrock and Wells (1982) employ regression analysis to estimate hotel demand.

As previously stated, Carvell and Herrin (1990) argue that “pricing schemes have largely ignored the implicit prices of some attributes offered by hotels.” Thus, hedonic analysis is the preferred methodology for this thesis. Specifically, the hedonic model provides the necessary information to answer several research questions. First, what major explanatory variables account for the observed variations in individual hotel room rates? Second, what are the key spatial variables at work? Third, what is the relative importance of these spatial or situational variables vis-à-vis other factors? That is, are situation variables more or less important than (site) characteristics of the hotel itself? Fourth, how do these results compare at different geographic scales?

#### **4.2. Theoretical Model**

To assess the relationship of location and price, hedonic analysis is now employed for both the regional and local scale data. As a conceptual point of departure, it is hypothesized that room rate is function of site and situation. Thus,  $PRICE = f(\text{site, situation})$  where the vectors site and situation represent hotel site and situation characteristics, respectively. Drawing from Burt and Barber's (1996) housing price example, suppose the results of the hedonic price estimation for a hotel room yields the following equation:

$$\text{Hotel room price} = \$35.00 + \$5.00 (\text{pool}) - \$2.50(\text{interstate}) + \$4.00(\text{distance to CBD in miles})$$

By using this equation, it is possible to estimate the room price of a hotel room with a pool located next to an interstate and 10 miles from the central business district as \$35.00 + \$5.00(1) - \$2.50(1) + \$4.00(10) = \$77.50. The coefficients of the equation are the implicit prices consumers pay for this particular hotel room. For example, a customer is charged \$5.00 extra to stay at a hotel with a pool. The conceptual model serves as a methodological framework for both the regional and local analyses. Specifically, each data set uses a comprehensive model that is specified as a linear function of site and situation variables and takes on the form:

$$\text{PRICE}_i = \beta_0 + \sum_{k=1}^p \alpha_k S_k(i) + \sum_{k=1}^q \gamma_k H_k(i) + \varepsilon(i),$$

where

$S_k, k=1, \dots, p$  are the  $p$  site variables listed in Table 3.1,  
 $H_k, k=1, \dots, q$  are the  $q$  situation variables listed in Table 3.1,  
 $\beta, \alpha,$  and  $\gamma$  are parameters,  
 $\varepsilon(i)$  are random error terms, i.i.d. as  $N(0, \sigma)$ .

### 4.3. Empirical Analysis

#### 4.3.1. Regional Model

The empirical analysis treats the regional and local data separately. Similar to Waldorf (1991), alternative models are specified, estimated, and compared for both sets of data. For the regional data, three models are estimated using OLS for each dependent variable. As a first approximation, model 1.a. (or 1.b.) is a linear function of site and situation variables and takes on the form:

$$\begin{aligned} \text{SP (or WP)} = & \beta_0 + \beta_1 \text{POOL} + \beta_2 \text{BRKFST} + \beta_3 \text{SPA} + \beta_4 \text{ROOMS} + \beta_5 \text{ISTATE} + \beta_6 \text{STEMP (or} \\ & \text{WTEMP)} + \beta_7 \text{STEMP}^2 \text{ (or WTEMP}^2) + \beta_8 \text{RM\_PER} + \beta_9 \text{METRO} + \beta_{10} \text{INC} + \\ & \beta_{11} \text{CNTYSNT} + \beta_{12} \text{BW} + \beta_{13} \text{EL} + \beta_{14} \text{M6} + \beta_{15} \text{S8} + \beta_{16} \text{TL} + \epsilon \end{aligned} \quad (1.a. (b.))$$

To determine if, individually, site or situation factors better explain the variance in SP and WP, Model 1 (a and b) is evaluated against the site and situation models. The site model includes the site variables, while the situation model includes the situation variables.

*Model 2 (a and b) (site):*

$$\begin{aligned} \text{SP (or WP)} = & \beta_0 + \beta_1 \text{POOL} + \beta_2 \text{BRKFST} + \beta_3 \text{SPA} + \beta_4 \text{ROOMS} + \beta_5 \text{BW} + \beta_6 \text{S8} + \beta_7 \text{TL} + \beta_8 \text{EL} \\ & + \beta_9 \text{M6} + \epsilon \end{aligned} \quad (2.a.) \text{ and } (2.b.)$$

*Model 3 (a and b) (situation):*

$$\begin{aligned} \text{SP (or WP)} = & \beta_0 + \beta_1 \text{ISTATE} + \beta_2 \text{STEMP (or WTEMP)} + \beta_3 \text{METRO} + \beta_4 \text{INC} + \beta_5 \text{RM\_PER} + \beta_6 \\ & \text{CNTYSNT} + \epsilon \end{aligned} \quad (3.a.) \text{ and } (3.b.)$$

#### 4.3.2. Local Model

For the Tucson data, four models are estimated using OLS. As a first approximation, Model 5 is the fully specified model. Model 5 is specified as a linear function of site and situation variables and takes on the form:

$$\text{PRICE}_i = \beta_0 + \sum_{k=1}^p \alpha_k S_k(i) + \sum_{k=1}^q \gamma_k H_k(i) + \epsilon(i), \quad (5)$$

where

$S_k, k=1, \dots, p$  are the  $p$  site variables listed in Table 3.4,

$H_k, k=1, \dots, q$  are the  $q$  situation variables listed in Table 3.4,  
 $\beta, \alpha,$  and  $\gamma$  are parameters,  
 $\varepsilon(i)$  are random error terms, i.i.d. as  $N(0, \sigma)$ .

From this comprehensive model, several site and situation variables tend to covary. To minimize the problem of multicollinearity, correlated variables are eliminated to reduce the total number of independent variables that do not contribute to the explained variance in PRICE. Variables were considered correlated if  $r > 0.6$ . In light of the principle of parsimony, independent variables not contributing significantly to the explanatory power are eliminated as well. However, selected insignificant explanatory variables remain in the model for purposes of discussion. Model 6 is the refined and preferred parsimonious model and takes on the form:

$$\begin{aligned} \text{PRICE} = & \beta_0 + \beta_1 \text{POOL} + \beta_2 \text{BRKFST} + \beta_3 \text{ROOMS} + \beta_4 \text{AGE} + \beta_5 \text{CHAIN} + \beta_6 \text{LANDVL} + \\ & \beta_7 \text{ONE} + \beta_8 \text{TWO} + \beta_9 \text{THREE} + \beta_{10} \text{ISTATE} + \beta_{11} \text{AIRPORT} + \beta_{12} \text{AIRP\_SQ} + \beta_{13} \text{UA} \\ & + \beta_{14} \text{INC} + \varepsilon \end{aligned} \quad (6)$$

In an effort to determine the relative importance of spatial variables vis-à-vis site variables, two additional models are introduced and evaluated against Model 6. The site model includes the site variables, while the situation model includes the situation variables.

*Model 7 (site):*

$$\begin{aligned} \text{PRICE} = & \beta_0 + \beta_1 \text{POOL} + \beta_2 \text{BRKFST} + \beta_3 \text{ROOMS} + \beta_4 \text{AGE} + \beta_5 \text{CHAIN} + \beta_6 \text{LANDVL} + \\ & \beta_7 \text{ONE} + \beta_8 \text{TWO} + \beta_9 \text{THREE} + \varepsilon \end{aligned} \quad (7)$$

*Model 8 (situation):*

$$\text{PRICE} = \beta_0 + \beta_1 \text{ISTATE} + \beta_2 \text{AIRPORT} + \beta_3 \text{AIRP\_SQ} + \beta_4 \text{UA} + \beta_5 \text{INC} + \varepsilon \quad (8)$$

## CHAPTER 5

### RESULTS

#### 5.1. Regional Scale

The following discussion first concentrates on a regional perspective of the relationship between hotel room rates and site and situation variables, and then examines the relationship at the local scale. The parameter estimates, standard errors, and goodness-of-fit measures for the alternative model specifications are presented in Table 5.1. The parameter estimates (i.e., implied prices) show how, other things being equal, hotel room rates are affected by the presence of the associated variable. Models 1.a and 1.b contain the estimates for the fully specified model in which all hypothesized variables are considered. Models 2 (a and b) and 3 (a and b) include the estimates for only site and situation variables, respectively.

The findings of SP models will be evaluated followed by the WP models' results.<sup>1</sup> Model 1.a explains 61% of the variation in hotel room rates.<sup>2</sup> The parameter estimate signs are not consistent with all prior expectations. However, all but two variables are significant using a two-tailed t-test on a 5% significance level. One site and one situation variable enters the model as insignificant. A correlation matrix is provided in Appendix A.

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<sup>1</sup> Alternatively specified models were considered by employing the lowest published room rate for each time period as the dependent variable. However, the models yield similar parameter estimates and goodness-of-fit measures.

<sup>2</sup> Results are limited to room rates less than \$124.00. Nine observations have extremely large residuals, and thus are omitted. Outliers are defined as any observation with a standard Z-score less than -3.5 or

The effect of site variables on room rates was mixed and often inconsistent with the hypothesis of having a positive influence on summer room rates. Among the hotel amenities, the variable BRKFST has the largest impact on room rates. BRKFST unexpectedly has a negative effect on summer prices. The negative estimate suggests that consumers pay less for a hotel room if the hotel offers a complimentary breakfast. The model estimates that summer room rates are reduced \$3.90 at hotels that serve complimentary breakfast. The cause for this outcome is unclear. However, it is possible that competing hotels also serve free breakfast and the competition results in reduced rates to attract customers.

As previously hypothesized, SPA has a positive effect on summer price. The model suggests summer room rates increase by \$2.93 at hotels that have a spa or hot tub. Approximately 40% of the hotels in the sample have a spa or hot tub. The additional cost to consumers is likely to be attributable to the added operations and maintenance costs associated with the spa.

Hotel size (i.e. number of rooms) is highly significant but only has a modest effect on summer room rate. As expected, the variable ROOMS has a positive effect on summer prices. The model indicates that for a 1-room increase in hotel size, the room rate increases by only \$0.07. The increase in room rate is possibly attributable to added costs associated with extra rooms, such as additional supplies and labor. It is possible that the minor effect is due to supply and labor economies of scale.

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greater than 3.5. Including all observations yields similar parameter estimates and the  $R^2$  is reduced to .59.

TABLE 5.1. - Parameter Estimates for Regional Models

Variable	Model 1 - Comprehensive				Model 2 - Site				Model 3- Situation			
	1.a. (SummerPrice)	1.b. (WinterPrice)	2.a. (SummerPrice)	2.b. (WinterPrice)	3.a. (SummerPrice)	3.b. (WinterPrice)	Parameter Estimate	t-stat	Parameter Estimate	t-stat	Parameter Estimate	t-stat
R <sup>2</sup>	0.609	0.599	0.502	0.533	0.146	0.102						
R <sup>2</sup> <sub>adj</sub>	0.598	0.588	0.494	0.526	0.137	0.091						
Standard Error	12.416	11.488	13.931	12.32100429	18.200	17.067						
Observations	575	575	575	575	575	575						
df	574	574	574	574	574	574						
<b>Variable</b>	<b>Parameter Estimate</b>	<b>t-stat</b>	<b>Parameter Estimate</b>	<b>t-stat</b>	<b>Parameter Estimate</b>	<b>t-stat</b>	<b>Parameter Estimate</b>	<b>t-stat</b>	<b>Parameter Estimate</b>	<b>t-stat</b>	<b>Parameter Estimate</b>	<b>t-stat</b>
CONSTANT	91.728	11.967	70.482	6.201	69.666	24.842	59.978	24.118	77.864	7.220	57.835	3.483
<b>SITE</b>												
POOL	0.733	0.468	-2.250	-1.548	-3.389 *	-2.011	-2.105	-1.413				
BRKFST	-3.900 *	-2.763	-1.775	-1.358	-2.382	-1.514	-1.157	-0.830				
SPA	2.932 *	2.444	3.808 *	3.409	4.877 *	3.676	4.582 *	3.903				
ROOMS	0.069 *	4.846	0.068 *	5.238	0.088 *	5.940	0.099 *	7.663				
BW	-4.685 *	-2.600	-4.054 *	-2.411	-5.005 *	-2.496	-4.213 *	-2.358				
EL	-14.237 *	-5.693	-15.865 *	-6.847	-14.355 *	-5.162	-16.003 *	-6.498				
M6	-40.537 *	-16.919	-36.294 *	-16.344	-39.920 *	-14.896	-35.452 *	-14.960				
S8	-25.182 *	-11.455	-23.877 *	-11.669	-25.769 *	-10.480	-23.461 *	-10.757				
TL	-15.165 *	-5.911	-15.468 *	-6.497	-15.286 *	-5.378	-15.196 *	-6.035				
<b>SITUATION</b>												
STEMP	-0.605 *	-8.429							-0.627 *	-6.280		
STEMP^2												
WTEMP			0.106 *	-2.901							-1.435 *	-2.068
WTEMP^2			0.017 *	3.150							0.017 *	2.065
ISTATE	-3.429 *	-3.178	-1.820	-1.816					-4.629 *	-2.961	-3.321 *	-2.257
ROOM%	3.101	1.875	6.065 *	3.937					7.367 *	3.140	10.329 *	4.663
METRO	4.819 *	3.552	2.542 *	2.024					2.118	1.110	0.467	0.260
INC	0.259 *	2.883	0.266 *	3.150					0.236 *	1.804	0.247 *	1.988
EMP	25.871 *	2.751	15.944	1.842					37.985 *	2.783	28.801 *	2.263

\* Significant at p = .05, 2-tailed test

As previously hypothesized, hotel chains significantly influence summer prices. However, all chains have a negative effect on room rates. The model does not support the previous hypothesis that the largest chains charge a premium. Simply aggregating the hotels for each chain is probably a crude measure of chain size and thus, is not a plausible contributor to room rates. Instead, the model estimates that Comfort Inn is the most expensive hotel in the sample. In general, customers can expect to pay less for the other hotels. All other things being equal, it is estimated that room rates are reduced (relative to Comfort Inn) by \$4.69, \$25.18, \$15.17, \$14.24, and \$40.54 for Best Western, Travel Lodge, Econolodge, Super 8, and Motel 6, respectively. Not surprisingly, Motel 6 hotels are least expensive, whereas Comfort Inn is the most expensive hotel chain. Chains with higher room rates, such as Comfort Inn, may reflect a higher level of quality and service provided to customers. Interestingly, the hotel chain dummy variables account for the majority of the variance. This suggests that the relationship between room rates and the explanatory variables is unique for each chain.

Surprisingly, POOL enters as an insignificant variable. This suggests that room rates are not affected whether the hotel has a pool or not. Thus, consumers should not expect a higher room rate in the summer at a hotel with a pool. This finding is not consistent with intuitive reasoning. However, the insignificance of a pool supports a 1990 survey by the Consumer's Union. The survey found that fewer than one in four guests use hotel swimming pools (Lewis and Nightingale, 1991). Approximately 78% of the hotels in the sample have a pool. Perhaps the presence of a pool is not important to customers and therefore not a factor in room rates.

Among the situation variables, the variable EMP has the largest effect on room rates.<sup>3</sup> As expected, county employment structure has a significant positive relation with summer prices. In general, counties with a high percentage of Service and Retail Trade employment have higher room rates. The model suggests that an increase in service and retail trade employment by 1 percentage point causes an increase in summer room rates by \$25.87. Thus, counties with an employment structure favoring tourism, among other industries, are likely to have high room rates.

The variable METRO has a significant positive effect on room rates, suggesting that hotels cost more in metropolitan areas. It is estimated that summer rooms cost an additional \$4.82 for hotels that are located in MSAs. Factors such as higher room demand, higher employment costs, and higher taxes and land value/rents may contribute to the higher rates.

The presence of an interstate has a highly significant effect on summer rates as well. As expected, ISTATE has a negative relation with summer prices. The model suggests that interstate hotels charge \$3.43 less for rooms than hotels not located on an interstate. The cheaper room rates on the interstate may be the result of competition for transient, price-sensitive customers. Hotels tend to cluster around interstate interchanges and thus compete for interstate users. In addition, many travelers are perhaps only staying one night and simply need a comfortable place to sleep without a lot of frills while traveling on the interstate.

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<sup>3</sup> As an alternative, several variables were also considered: county share of state's accommodation employment, county share of state's total number of accommodations, and county share of state's service employment. However, the models yield similar parameter estimates and do not improve the goodness of fit measures.

A significant negative relation is established between summer prices and the linear term of STEMP. As expected, the negative coefficient indicates that high temperatures result in lower summer room rates. The model estimates that for every one-degree increase, room rates decrease by \$0.61. In contrast, the variable's quadratic term is insignificant at the .05 level. This indicates that the relationship between summer temperature and summer price is linear. *Ceteris paribus*, for example, the summer room rates in Phoenix are likely to be lower than room rates in Denver due to the hotter climate in Phoenix.

The remaining situation variable, ROOM%, is insignificant at the .05 level. Thus, the hypothesis that hotels with a large share of rooms in a zip code region charge more for a room cannot be confirmed. The insignificant result may be due to the level of enumeration for room supply; zip code regions are perhaps too large to accurately measure room supply's effect on room rates.

In an effort to determine the relative importance of situational variables vis-à-vis site factors, two additional models are introduced. Model 2.a contains the estimates for the model in which only site attributes are considered. In contrast, Model 3.a only considers situation variables. The alternatively specified models are found to account for a smaller portion of the variation in summer room rates. The site model accounts for 50% of the variation in room rates, whereas the situation model captures only 15% of the variation. Thus, omitting site characteristics substantially reduces the explanatory power of the hedonic pricing model. In addition, the explanatory power of Models 2.a and 3.a are too small to be very informative.

All but one site variable is significant at the .05 level for Model 2.a. The hotel chain dummy variables have the most important effect on summer room rates. Once again, the omitted hotel chain, Comfort Inn, emerges as the most expensive chain. The negative parameter estimates reflect how much the price is reduced from Comfort Inn for each chain represented by the dummy variables. The presence of a spa remains important. The model estimates that a room costs an additional \$4.87 at hotels with a spa. In contrast to Model 1.a, the presence of a pool becomes significant and the variable BRKFST becomes insignificant. It is estimated that room rates are reduced by \$3.39 at hotels with a pool. Hotel size, once again, has a minor effect on room rates. The model indicates that a one-room increase in hotel size only increases the room rate by \$0.09. The only noteworthy result from the situation model is that room ratio becomes significant and that METRO becomes insignificant.

In light of the constrained models' poor results, we are led to consider if the comprehensive model's explanatory power is significantly greater than that of Models 2.a and 3.a. Each model was compared to Model 1.a using an F-test and the results permit us to prefer the comprehensive model over both the site and situation model. The F-test indicates that the explanatory power of Model 1.a is significantly greater than the other two models. This suggests that summer room rates are better explained by a combination of site and situation variables rather than site or situational factors independently.

A similar comprehensive model was constructed employing winter room rate as the dependent variable. Model 1.b accounts for 60% of the variation in winter room

rates.<sup>4</sup> The parameter estimates have the same significant signs as the summer price model. However, the significance of some variables changes; WTEMP2 and ROOM% enter as significant, while BRKFST, ISTATE, and EMP enter as insignificant parameter estimates. In addition, only minor differences emerge in the estimated coefficients. Thus, a detailed discussion of the results is omitted in light of the previous discussion of models 1.a, 2.a, and 3.a.

At the regional scale, the results demonstrate that summer and winter room rates behave similarly in relation to the predictor variables in this study. In general, the variation in room rates is best explained by a combination of nonspatial and spatial variables. This suggests that geographic factors do in fact influence hotel room rates. The models and the majority of the variables are statistically significant. In addition, the comprehensive models' explanatory power is promising considering the large geographic area and the potential for large price variation among the large sample size. The majority of the variance in room rates is accounted for by hotel chain dummy variables. This lack of explanatory power is likely due to model misspecification. However, several variables that can improve the results, a priori, are difficult to obtain at this particular regional scale. Therefore, a second research effort was undertaken at the local scale. Several other pertinent site and situation attributes are incorporated into the hedonic model in an effort to improve the results.

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<sup>4</sup> Results are limited to room rates less than \$115.00. Nine observations have extremely large residuals,

## 5.2. Local Scale

The parameter estimates, standard errors, and goodness-of-fit measures for the alternative model specifications are summarized in Table 5.2. The parameter estimates (i.e., implied prices) show how, other things being equal, hotel room rates are affected by the presence of the associated variable. The first model (Model 6) contains the estimates for a parsimonious version of Model 5.<sup>5</sup>

Model 5 accounts for 87% of the variation in hotel room rates. However, the overspecification is problematic in light of the principle of parsimony. Furthermore, many of the variables tend to covary ( $r > 0.6$ ). For example, the majority of Tucson attractions covary and are best represented by the Airport, Interstate, or the University of Arizona. A correlation matrix is provided in Appendix C. Additionally, all but three variables have insignificant estimated coefficients using a two-tailed t-test on a 5% significance level. Moreover, comparing Models 5 and 6 using an F-test suggests that the explanatory power of Model 5 is not significantly greater than that of Model 6. Model 6 accounts for 86% of the variation in hotel room rates.<sup>6</sup> Thus, the reduction of explanatory variables, the greater significance of parameter estimates, and the improved goodness of fit measures permit us to prefer Model 6 to Model 5.

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and thus are omitted. Outliers are defined as any observation with a standard Z-score less than -3.5 or greater than 3.5. The elimination of outliers reduces the  $R^2$  and number of significant parameter estimates.

<sup>5</sup> The results of the comprehensive model (Model 5) are included in Appendix B. The model parameters exhibit multicollinearity as well as a large number of insignificant estimates. Consequently, the discussion of Model 5 is omitted.

<sup>6</sup> The observations are limited to room rates less than \$109.00. Four observations have extremely large residuals and are therefore omitted. Outliers are defined as any observation with a standard Z-score greater than 2.

In contrast to Model 5, the results of Model 6 are more useful measures to address the specific research questions of this thesis. Many situational variables are highly

**TABLE 5.2. - Parameter Estimates for Local Models**

	<b>Model 6 - Comprehensive</b>		<b>Model 7 - Site</b>		<b>Model 8 - Situation</b>	
R <sup>2</sup>	0.86		0.774		0.415	
Adjusted R <sup>2</sup>	0.835		0.75		0.382	
Standard Error	9.539		11.738		18.465	
Observations	93		93		93	
df	79		84		88	
<b>Variable</b>	<b>Parameter Estimate</b>	<b>t-statistics</b>	<b>Parameter Estimate</b>	<b>t-statistics</b>	<b>Parameter Estimate</b>	<b>t-statistics</b>
CONSTANT	58.404	4.537	31.920	6.061	86.534	4.204
<b>Site</b>						
POOL	-3.081	-0.999	-1.037	-0.279		
BRKFST	6.423 *	2.314	8.356 *	2.489		
ROOMS	0.104 *	2.967	0.082 *	1.951		
AGE	0.006	0.063	-.112	-1.218		
CHAIN	7.837 *	2.503	5.614	1.471		
LANDVL	0.004	0.654	0.008	1.195		
ONE	-0.503	-0.099	-7.21	-1.198		
TWO	1.332	0.372	1.091	0.248		
THREE	17.127 *	4.736	20.565 *	4.787		
<b>Situation</b>						
ISTATE	3.136 *	6.124			5.446 *	6.083
UA	-2.311 *	-2.691			-2.258	-1.483
AIRPORT	-4.602 *	-3.52			-6.413 *	-2.648
AIRP_SQ	0.182 *	3.602			0.224 *	2.393
INC	-0.021	-0.21			0.123	0.654

\* Significant at p = .05, 2-tailed test

correlated. Thus, the model includes more site factors than situation factors.<sup>7</sup> In general, parameter estimate signs were consistent with the predicted signs. Although all

<sup>7</sup> As an alternative, several variables were also considered: 1990 median family income, number of AAA diamonds, and various interaction terms. However, the models yield results that are less satisfactory.

parameter estimates are not significant, the insignificant variables offer insight to what does not influence room rate variation. As such, selected insignificant parameters are included in the model.<sup>8</sup>

The effect of site factors on room rates was mixed. Hotels with a three-diamond AAA rating (THREE) had the largest impact on hotel room rates. The model suggests that rooms cost an additional \$17.13 in hotels with a three-diamond rating compared to hotels not rated by AAA. According to the AAA Tourbook, hotels receive a three-diamond rating (as compared to a one- or two-diamond rating) for "... a degree of sophistication. Additional amenities, services, and facilities may be offered. There is a noticeable upgrade in physical attributes, services, and comfort." In contrast, one- and two-diamond ratings for hotels do not significantly affect room rates. The insignificant effects may reflect homogeneity among non-rated hotels and one- and two-diamond hotels. For example, the quality and level of service for the non-rated LaQuinta hotel may be comparable to a Best Western hotel with a two-diamond rating. Thus, the price disparity between the two hotels may be minimal.

The estimated parameter on CHAIN indicates a positive relationship between room rate and hotels that are affiliated with a national chain. This finding is consistent with Wu (1998). According to the model, chain hotel room rates cost an additional \$7.84. One possible explanation for higher costs may be associated with franchise fees, additional services/amenities, and increased marketing expenses.

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<sup>8</sup> The elimination of insignificant variables from Model 6 does not change the  $R^2$  and yields similar parameter estimates.

As expected, hotels offering some form of a free breakfast charge more for a night's stay. The model suggests consumers will pay an additional \$6.42 for breakfast. It is important to note that the variable BRKFST captures a variety of breakfast options. Hotels were considered to offer a complimentary breakfast if, at a minimum, a continental breakfast (pastries, juice, and coffee) is offered to guests. The model's result is not very appealing if you realize donuts and coffee cost over \$6.00.

Hotel size (in terms of number of rooms) is significant but of little importance.<sup>9</sup> Although a positive relationship exists, the effect of more rooms on room rate is minor. The model indicates that for a 1-room increase in hotel size, the room rate increases by only \$0.10. This finding does not support the traditional room rate theory of \$1 per \$1000 rule. As previously noted in the literature review, one method for establishing room rates is to charge \$1 for each \$1000 invested per room. If a 100 room hotel costs \$2 million, the cost per room is \$20,000 and the room rate necessary for a fair return on the investment would be \$20.00 (Lundberg, Krishnamoorthy, and Stavenga, 1995). According to this method and assuming the total hotel costs remain the same, a one-room increase would reduce the room rate by approximately \$0.20. Thus, the hotel room with 101 rooms would cost about \$19.80.

Surprisingly, the remaining variables do not significantly affect room rate at the 5% significance level. The model suggests that room rates are not influenced by the presence of a pool, hotel age, or by assessed land value. One possible cause for the insignificance of a pool may be due to the time of year. The room rates reflect a rate in

November when, presumably not many pools are in use. Thus, hotels do not have the added operating expense in the winter and the savings may be reflected in the room rate. The insignificance of hotel age may be due to the average and range of hotel ages.<sup>10</sup> The average age is 28 years old and ranges from 2-62 years old.

Among the situational variables, distance to the airport has the greatest effect on room rates. The linear and quadratic terms of AIRPORT are both significant and the parameter signs meet prior expectations. In general, prices decrease as distance from the airport increases. However, room rate is minimized at a distance of 13 kilometers (or approximately 8 miles). This result suggests that a distance decay phenomenon is in effect. Hotels in close proximity to the airport charge a premium. The model estimates that for each 1 kilometer increase in distance from the airport, room rates decrease \$4.60. The distance decay is reversed for hotels located more than 13 kilometers away from the airport.

The impact of the interstate on room rates is evident in the model. As previously hypothesized, hotel room rates along the interstate are cheaper than room rates not located on the interstate. In general, hotel room rates increase as hotel distance increases from the interstate. The model suggests that for every 1-kilometer increase from the interstate, room rates will increase by \$3.14. The cheaper room rates on the interstate may be the result of competition for transient, price-sensitive customers. Hotels are in competition to attract travelers driving on the interstate. Many travelers are perhaps only

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<sup>9</sup> Inclusion of the quadratic term yields an insignificant parameter estimate and does not improve the results.

<sup>10</sup> Inclusion of the quadratic term yields an insignificant parameter estimate and does not improve the results.

staying one night and simply need a comfortable place to sleep while traveling on the interstate.

The variable UA is significant and the negative effect on room rates is consistent with prior expectations. In general, hotels in the vicinity of the university charge more for rooms than elsewhere. The model suggests room rates decrease by \$2.31 for every 1-kilometer increase from the university. As previously mentioned, UA was highly correlated with TCC ( $r=0.94$ ) and for this study, TCC proxies for the CBD. Thus, the effect of UA can be extended to include the CBD. The higher prices around the university may be caused by a higher demand for rooms in the university and downtown areas.

The model suggests that the relationship between INC and hotel room rates is not significant using a two-tailed t-test on a 5% significance level. Since INC serves as a level of socioeconomic status, socioeconomic conditions do not have a significant impact on the variation of room rates. One possible cause for the insignificance is the enumeration level. INC represents the median household income of each hotel's census block group. Perhaps results would improve if income was measured at a larger enumeration level such as census tract. The result implies that higher income areas do not necessarily mean that room rates will cost more as compared to room rates in low income areas.

Models 7 and 8 are now introduced to better isolate the relationship between site and situation effects with room rates. Model 7 does not control for situation variables, whereas model 8 fails to control for site variables. The site model accounts for 77% of

the variation in room rates. In contrast, the situation model only accounts for 42% of the variation. Thus, structural factors alone account for a greater proportion of the variance in room rates as compared to locational variables. The effect of site variables is mixed and often insignificant due to the failure to control for situation variables. The significant variables in Model 6 remain significant with the exception of CHAIN. The relationship between CHAIN and room rates is insignificant using a two-tailed t-test on a 5% significance level. The relative importance of THREE and BRKFST are consistent with Model 6. However, the magnitude of ROOMS changed significantly. The model indicates that room rates increase by approximately \$8.20 for every additional room.

Comparing the goodness of fit measures between Model 6 and Model 7 suggests that the variation in hotel room rates are better explained by including more than structural variables alone. The relatively poor performance of Model 7 suggests that the model should consider additional variables. The isolated relationship between situation variables and room rates (Model 8) is also not as promising as in Model 6. Not only does the model account for a smaller proportion of the variance, but UA becomes insignificant at the 5% level as well. The results indicate that situational variables alone do not satisfactorily explain the variation of hotel room rates.

The results of Model 7 are more promising than Model 8. However, each model was compared to the more comprehensive, yet parsimonious model (Model 6) using an F-test. In both cases, the F-tests suggest that the explanatory power of Models 7 and 8 is not significantly greater than that of Model 6. Thus, Model 6 is preferred over both the site-only and situation-only model. This suggests that nonspatial (site) and spatial

(situation) variables rather than nonspatial or spatial variables alone better explain hotel room rates.

Overall, these results demonstrate that hotel room rate is a function of site and situation. Similar to the regional model, the variation in room rates is best explained by a combination of nonspatial and spatial variables. This suggests that geographic factors do in fact influence hotel room rates. As expected, improved results are achieved because the preferred explanatory variables were included in the local scale model.

In summary, the results of the regional and local models yield implicit prices of hotel site and situation attributes. Thus, if attributes for a hotel change, hotel decision makers can better understand the potential impact a change has on room rates (Carvell and Herrin, 1990). Furthermore, it has been shown that both time series (albeit relatively short) and one point in time price variations are influenced by hotel location.

## CHAPTER 6

### SUMMARY AND CONCLUSION

This research has contributed to our understanding of the observed spatial heterogeneity of hotel room rates. The study reveals that hedonic pricing models are suitable for providing the estimation of implicit prices of nonspatial and spatial hotel attributes. This issue was examined in the context of site and situation. The site and situation framework captures locational effects on individual hotel room rates. The results are shown to reflect the relative importance of site and situation variables in determining room rates.

A multi-scale approach was conducted to systematically reveal the implicit prices of hotel room rates. The spatial variation of hotel room rates was examined at the regional and local scale. The two-scale approach permitted (through alternative model specifications) the inclusion of different hypothesized variables that influence room rates. At the regional level, 1998 data from 584 hotels in Arizona, Colorado, New Mexico, and Utah were examined. Analysis consisted of a summer and winter dependent variable. The majority of hypothesized variables significantly contributed to the explained variation in room rates. Specifically, hotel-chain dummy variables, county employment structure, metropolitan areas, and complimentary breakfast were the major explanatory variables that accounted for the observed variations in individual hotel room rates. Hotels with a spa, the number of rooms per zip code, hotels in metropolitan areas, median family income, and percent of service and trade employment are the variables that have a

significant positive effect on summer room rates. In contrast, complimentary breakfast, interstate hotels, average summer temperature, and hotel chain dummy variables have significant negative effects on summer room rates. In general, the key spatial variables include percent of state service and trade employment, metropolitan-area hotels, and the presence of an interstate. Motel 6 and Super 8 hotels, hotel size, and average summer temperature explain the majority of variance in summer room rates. Thus, spatial attributes are relatively less important than nonspatial attributes. However, the low  $R^2$  value implies that unspecified site and/or situation variables may still significantly contribute to the explained variance. Therefore, alternative variables were considered and incorporated into the local scale analysis.

The local study consisted of data for 98 hotels in Tucson, Arizona, for November 18, 1999. The majority of hypothesized variables significantly contribute to the explained variation in room rates. Specifically, complimentary breakfast, distance to the airport, hotel chains, and hotels with a AAA three-diamond rating are the major explanatory variables that account for the observed variations in individual hotel room rates. Hotel size, hotel chain, complimentary breakfast, three-diamond rating, distance to interstate, and airport squared have significant positive effects on room rates. In contrast, distance to the airport and University of Arizona have significant negative effects on room rates. The key spatial variables include distance to the interstate, airport, and University of Arizona. The majority of variance in room rates is explained by hotels with a AAA three-diamond rating, hotel size, distance to the interstate, hotel chains, and complimentary breakfast.

Comparing the results of both studies demonstrates that the local study models were shown to explain hotel room rate variation better than the regional study models. The improved results are attributable to the incorporation of better explanatory variables. However, both sets of findings are similar in that the variation in hotel room rates is best explained by a combination of nonspatial and spatial variables. This research reveals that site and situation attributes are systematically reflected in hotel room rates. In both cases, the models yield implicit price estimates of hotel site and situation attributes. Thus, it is now possible to estimate the dollar impact these attributes have on room rates, information that may be useful for industry decision-makers and marketing strategies. Furthermore, it has been shown that both time series (albeit relatively short) and one point in time price variations are influenced by hotel location.

The empirical investigation attempted to explain room rate variation at two geographic scales. In both cases, the results are consistent with the view that hotel room rate is a function of site and situation. While site factors explain the majority of the variation in room rates, situation factors also significantly influence room rates. In general, hedonic models that account for both nonspatial and spatial attributes were shown to explain room price variation better than models that accounted for one or the other.

Although the results of this thesis are enlightening, particularly at the local scale, there are several issues that provide the opportunity for future research. First, there is a key spatial component that was not considered in this study. One possible extension of this thesis would be to examine the spatial interdependencies of hotel room rates. This

can be accomplished by incorporating spatial autoregressive terms in the hedonic models. For example, examining spatial autocorrelation among the residuals would provide insight on the degree to which room rates at one hotel are affected by room rates at nearby hotels. It is argued that hotels exhibit positive spatial autocorrelation, thus future empirical research on the impact of neighboring hotels may be worthwhile. Tests for spatial dependence on room rates could enhance the geographical focus of this study and better explain the role location plays in room rate variation.

Second, future research should consider employing alternative measures of room rates to improve the reliability of the results. This can be accomplished by including time series room rate data or average daily room rates (ADR's). Temporal data would provide more generalized results and could better account for seasonality and "average" market conditions. Thus, results may be more generalized and could be better applied to other times of the year. Obtaining ADR data is a difficult task for the general public, however lodging industry practitioners with access to ADR data could help shed further light on hotel room rate variation using ADR's.

Third, this investigation could be combined with research on consumer behavior. Carvell and Herrin (1990) suggest that the implicit price estimates can be used to estimate attribute demand functions. They argue that knowledge of consumer willingness to pay for hotel amenities is beneficial to decision-makers attempting to include the right mix of attributes to make informed site selection decisions. The combination of room rate variation research and consumer behavior research can help our understanding of the impact changes in attributes and room prices have on consumer demand.

Fourth, future research could include additional spatial variables (e.g., traffic counts) that may help contribute to the variation of hotel room rates. Thus, in light of these issues, further research on the relationship between location and room pricing may therefore be worthwhile.

## APPENDIX A

	SP	WP	POOL	BRKFST	SPA	ROOMS	ISTATE	STEMP	STEMP_SQ	WTEMP	SMETRO	INC	RM_PER	BW	S8	TL	EL	M6	SNTPERC	EMP	SVS	HOT	EMP
SP	Pearson Correla	1.000	0.793	0.105	0.302	0.340	0.143	-0.166	-0.247	-0.239	-0.247	0.078	0.195	0.171	0.417	-0.282	0.012	-0.028	-0.466	-0.033	0.197	0.186	0.000
	Sig. (2-tailed)		0.000	0.011	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.773	0.497	0.000	0.429	0.000	0.998	
WP	Pearson Correlation		1.000	0.143	0.331	0.348	0.168	-0.114	-0.018	-0.004	-0.015	0.105	0.211	0.237	0.423	-0.297	0.000	-0.073	-0.417	0.161	0.165	0.212	0.182
	Sig. (2-tailed)			0.001	0.000	0.000	0.000	0.006	0.671	0.931	0.709	0.858	0.011	0.000	0.000	0.000	0.985	0.077	0.000	0.000	0.000	0.000	
POOL	Pearson Correlation			1.000	0.081	0.228	0.260	0.027	0.276	0.272	0.261	0.117	0.053	0.044	0.238	-0.450	0.049	-0.108	0.177	0.127	0.022	0.022	0.137
	Sig. (2-tailed)				0.050	0.000	0.000	0.520	0.000	0.000	0.000	0.005	0.197	0.290	0.000	0.000	0.236	0.009	0.000	0.002	0.803	0.602	
BRKFST	Pearson Correlation				1.000	0.224	-0.143	-0.054	-0.076	-0.076	-0.049	0.002	0.041	-0.034	0.080	-0.322	0.099	0.120	-0.356	0.053	0.041	-0.001	
	Sig. (2-tailed)					0.000	0.001	0.197	0.067	0.068	0.233	0.217	0.955	0.418	0.054	0.000	0.017	0.004	0.000	0.529	0.323	0.424	
SPA	Pearson Correlation					1.000	0.011	-0.092	-0.065	-0.058	-0.084	-0.072	-0.043	0.053	0.060	0.270	0.055	-0.102	-0.300	-0.004	0.110	0.054	0.007
	Sig. (2-tailed)						0.789	0.027	0.117	0.160	0.044	0.081	0.299	0.199	0.000	0.038	0.183	0.014	0.000	0.921	0.008	0.189	
ROOMS	Pearson Correlation						1.000	0.090	0.176	0.176	0.159	0.348	0.235	0.146	0.080	-0.220	-0.033	-0.142	0.320	0.316	0.156	0.254	
	Sig. (2-tailed)							0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.052	0.000	0.429	0.001	0.000	0.000	0.000	0.317	
ISTATE	Pearson Correlation							1.000	0.063	0.056	0.032	0.022	0.101	-0.039	-0.103	-0.014	-0.019	0.030	0.116	0.030	-0.031	-0.063	0.027
	Sig. (2-tailed)								0.129	0.177	0.446	0.596	0.014	0.348	0.000	0.013	0.734	0.644	0.464	0.005	0.463	0.454	
STEMP	Pearson Correlation							1.000	0.998	0.998	0.938	0.929	0.315	0.006	-0.023	-0.045	-0.071	0.062	-0.030	0.155	0.536	-0.055	0.509
	Sig. (2-tailed)								0.000	0.000	0.000	0.000	0.886	0.586	0.275	0.088	0.133	0.470	0.000	0.000	0.185	0.465	
STEMP_SQ	Pearson Correlation								1.000	0.944	0.942	0.322	0.021	-0.014	-0.044	-0.070	0.065	-0.031	0.153	0.550	-0.037	0.045	0.525
	Sig. (2-tailed)									0.000	0.000	0.000	0.611	0.738	0.288	0.093	0.119	0.455	0.000	0.000	0.374	0.273	
WTEMP	Pearson Correlation								1.000	1.000	0.993	0.324	0.002	-0.018	-0.051	-0.058	0.058	-0.032	0.159	0.503	0.000	0.064	0.487
	Sig. (2-tailed)										0.000	0.000	0.969	0.656	0.217	0.160	0.162	0.447	0.000	0.000	0.996	0.124	
WTEMP_SQ	Pearson Correlation										1.000	0.327	0.023	-0.002	-0.047	-0.057	0.060	-0.034	0.157	0.523	0.012	0.079	0.508
	Sig. (2-tailed)											0.000	0.576	0.965	0.252	0.166	0.147	0.414	0.000	0.000	0.778	0.056	
METRO	Pearson Correlation											1.000	0.466	0.089	-0.160	-0.066	0.112	0.005	0.180	0.548	0.322	0.482	0.536
	Sig. (2-tailed)												0.000	0.032	0.000	0.114	0.007	0.900	0.000	0.000	0.000	0.000	
INC	Pearson Correlation												1.000	0.000	-0.077	-0.070	0.021	0.009	0.115	0.354	0.384	0.454	0.362
	Sig. (2-tailed)													0.005	0.061	0.090	0.617	0.832	0.005	0.000	0.000	0.000	
RM_PER	Pearson Correlation													1.000	0.157	-0.034	-0.117	-0.140	0.002	0.145	0.002	0.167	0.115
	Sig. (2-tailed)														0.000	0.409	0.005	0.001	0.960	0.000	0.005	0.000	
BW	Pearson Correlation														1.000	-0.389	-0.182	-0.190	-0.301	-0.109	-0.045	-0.100	
	Sig. (2-tailed)															0.000	0.000	0.000	0.008	0.008	0.784	0.016	
S8	Pearson Correlation															1.000	-0.145	-0.151	-0.239	-0.071	-0.059	-0.081	-0.081
	Sig. (2-tailed)																0.000	0.000	0.000	0.085	0.153	0.140	0.051
TL	Pearson Correlation																1.000	-0.071	-0.112	0.050	0.015	0.076	0.080
	Sig. (2-tailed)																	0.089	0.007	0.230	0.722	0.763	0.145
EL	Pearson Correlation																	1.000	-0.117	0.020	0.037	0.026	0.024
	Sig. (2-tailed)																		0.005	0.631	0.377	0.535	0.557
M6	Pearson Correlation																		1.000	0.159	0.041	0.076	0.148
	Sig. (2-tailed)																			0.000	0.317	0.065	0.000
SNTPERC	Pearson Correlation																		1.000	0.228	0.442	0.985	0.000
	Sig. (2-tailed)																			0.000	0.000	0.852	0.268
EMP	Pearson Correlation																			1.000	0.000	0.000	0.000
	Sig. (2-tailed)																				0.000	0.000	0.455
EMP_SVS	Pearson Correlation																				1.000	1.000	0.000
	Sig. (2-tailed)																						0.000
HOT_EMP	Pearson Correlation																						1.000
	Sig. (2-tailed)																						

**APPENDIX B.**  
**Parameter Estimates for Model 5**

$R^2$	0.866	
Adjusted $R^2$	0.819	
Standard Error	11.145	
Observations	98	
df	72	

<b>Variable</b>	<b>Parameter Estimate</b>	<b>t-statistics</b>
(Constant)	224.421	0.387
<b>Site</b>		
POOL	-1.566	-0.396
BRKFST	3.963	1.130
ROOMS	0.083	0.949
ROOMS2	0.000	0.413
AGE	-0.333	-1.126
AGE2	0.005	1.065
CHAIN	10.542	2.567
LANDVL	0.004	0.730
ONE	0.403	0.064
TWO	-1.425	-0.301
THREE	17.775	3.881
<b>Situation</b>		
ISTATE	9.550	2.548
ISTATE2	-0.060	-0.097
UA	-1.402	-0.278
UA_SQ	-0.223	-0.343
AIRPORT	-3.203	-0.455
AIRP_SQ	0.488	1.259
STUDIOS	-7.506	-0.653
PIMAAIR	-14.108	-1.159
SABINO	2.855	0.180
TCC	-2.144	-0.568
MISSION	0.780	0.075
ZOO	3.937	0.869
INC	0.051	0.381
TRCTRM%	2.012	0.474

## APPENDIX C

## APPENDIX C

### CORRELATION MATRIX FOR LOCAL DATA

	PRICE	PRICE	ISTATE	MUSEUM	STUDIOS	PIMAAIR	SABINO	TCC	TCC_SQ	AIRPORT	ARP	SQ_UA	MISSION	ZOO	AGE	AGEZ	ROOMS	ROOMSZ	LANDVAL	IMPVAL	INC	CHAIN	TRCTRMWPOOL	BKRFST	RATED	ONE	TWO	THREE			
Pearson C	0.591	0.501	0.481	0.532	-0.181	-0.249	0.398	0.398	0.378	-0.044	0.016	0.311	0.039	0.119	0.038	-0.543	-0.541	0.722	0.659	0.766	0.182	0.560	0.212	0.328	0.505	0.648	-0.150	-0.015	0.752		
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
Pearson Correlation	0.945	0.708	0.816	0.816	-0.110	-0.720	0.573	0.500	0.668	0.676	0.002	0.005	0.243	0.704	0.000	-0.307	-0.319	0.250	0.165	0.375	0.420	0.073	0.162	0.078	0.176	0.336	0.260	0.141	0.885	0.000	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.693	0.797	0.797	0.797	-0.117	-0.732	0.528	0.493	0.197	0.162	0.342	0.256	0.421	0.629	0.000	-0.268	-0.315	0.237	0.140	0.375	0.398	0.168	0.111	0.446	0.083	0.304	0.266	0.074	-0.028	0.332	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.859	0.859	0.859	0.859	-0.733	-0.733	0.481	0.346	-0.475	-0.440	0.351	0.192	0.204	-0.357	0.000	-0.359	-0.378	0.339	0.256	0.391	0.438	0.066	0.190	0.092	0.107	0.231	0.338	-0.014	-0.067	0.411	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.945	0.945	0.945	0.945	-0.518	-0.454	0.670	0.553	-0.229	-0.169	0.508	0.371	0.062	0.210	0.000	-0.427	-0.435	0.325	0.233	0.395	0.458	0.156	0.212	0.084	0.163	0.287	0.358	0.081	-0.013	0.408	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.775	0.775	0.775	0.775	-0.029	-0.029	0.091	0.230	0.908	0.923	0.087	0.344	0.312	0.780	0.759	0.107	0.130	-0.253	-0.223	0.026	0.024	0.436	0.468	0.038	-0.092	-0.077	0.044	0.070	0.314	0.221	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.894	0.894	0.894	0.894	-0.408	-0.408	0.187	0.244	0.312	-0.539	0.255	0.000	0.000	0.000	0.011	0.584	0.834	0.594	0.571	0.969	0.092	0.378	0.389	0.709	0.367	0.450	0.268	0.265	0.095	0.095	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.897	0.897	0.897	0.897	0.408	0.611	0.942	0.887	0.408	0.611	0.584	0.834	0.594	0.571	0.969	0.092	0.378	0.389	0.709	0.367	0.450	0.268	0.265	0.095	0.095	0.095	0.095	0.095	0.095	0.095	
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Pearson Correlation	0.950	0.950	0.950	0.950	-0.524	-0.487	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.955	0.955	0.955	0.955	-0.524	-0.487	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664	0.600	0.408	0.664
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634	0.569	0.409	0.634
Sig (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pearson Correlation	0.967	0.967	0.967	0.967	-0.508	-0.461																									

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